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EDITORIAL

PROTEIN IN ORAL SURGERY

A properly nourished individual is one who receives and metabolizes a suitable combination of all substances necessary for health. The diet must contain protein, fat, carbohydrate, vitamins, certain minerals and water in optimum amounts, much greater than the minimum requirements of each nutriment, in order to provide for the accumulation of reserves.[1] Proteins are the essential constituents of both the protoplasm and the nucleus of cells. They are the main organic constituents of muscle and glandular tissues and are important in the osmotic processes between intracellular and extracellular fluid. In addition, the structure and function of the body tissues depend in a large measure on the presence of certain specific proteins such as the hormones, enzymes and antibodies.

The digestion, absorption and metabolism of proteins is a highly complex process ultimately resulting in breakdown of the proteins into their component amino acids of which twenty-two have been identified as nutritionally important. Rat experiments have shown ten of these amino acids to be necessary for growth. Of these ten at least eight are considered essential to the maintenance of nitrogen equilibrium in young human adults for limited periods. These are called the "essential" amino acids because they are necessary for some physiologic process and cannot be made by the body tissue but must be obtained from food. Protein foods of animal origin, meat from muscle and glandular tissue, eggs, fowl, fish, and milk contain all the essential amino acids and are complete. They are thus of higher nutritional value than vegetable protein although variety in the choice of foods is good nutritional practice.

1. Stare, F. J., and Davidson, C. S.: Protein: Its Role in Human Nutrition. J.A.M.A. 127:985, April 14, 1945.

Increased activity does not increase the body requirements for protein as it is not necessary to the production of energy provided that sufficient carbohydrate and fat are included in the diet. If, however, enough calories from nonprotein sources are not provided in the diet, amino acids will be used for energy rather than for replacing and building body proteins and plasma proteins, the albumins and the globulins. The several plasma globulin fractions have certain characteristic physical functions including the maintenance of fibrinogen, circulating antibodies and prothrombin.

The excess of absorbed amino acids are deaminated chiefly by the liver to form carbohydrates and nonprotein nitrogenous products that are excreted in the urine. The urine nitrogen represents the sum of nitrogen derived from the breakdown of body tissues plus that derived from food protein used for energy. When the nitrogen intake is equal to the nitrogen excretion over a period of several days a person is considered to be in nitrogen equilibrium. When excretion of nitrogen is greater than the intake, a negative nitrogen balance exists, indicating an increased catabolism of protein or inadequate ingestion, incomplete absorption or extensive loss of protein. A positive nitrogen balance, a greater intake than excretion, implies that nitrogen is being utilized for building body tissues.

Foods rich in proteins are also valuable sources of vitamin B complex and minerals, and diets deficient in protein may likewise be deficient in these other nutriments, resulting in multiple deficiencies. Protein requirements are much greater during the growth period and during pregnancy and lactation. In old age these requirements may be somewhat less than for the average adult. However, many conditions tend to impair the appetite sufficiently to result in a low protein intake and a gradual reduction in body proteins, as well as minerals and vitamins, to a point incommensurate with health.

There is a disturbance in protein metabolism in most illnesses such as acute and chronic infections, gastrointestinal disease, nephrosis, diabetes, acidosis or following severe injuries and burns.[2] Severe blood loss, continued bleeding, diarrhea, vomiting, salivary loss, internal exudates or transudates and extensive granulating or suppurating wounds may produce hypoproteinemia. It has been noted that excessive nitrogen excretion in the urine with negative balance has persisted for weeks after fractures, severe injuries and surgical operations. At the same time, the protein intake may be greatly reduced by loss of appetite, pain or poor gastrointestinal function which may result in serious hypoproteinemia unless prompt and effective steps are taken to secure a positive nitrogen balance.

It is therefore apparent that normal protein metabolism and adequate reserves are of supreme importance in the practice of surgery. The extensive

2. Lund, C. S., and Levenson, S. M.: Protein in Surgery. J.A.M.A. 128:95, May 12, 1945.

experience of World War II demonstrated the great importance of the preoperative correction of hypoproteinemia by organizing shock treatment and administering whole blood, plasma, etc., in acute conditions, and providing fully adequate diets, protein hydrolysates and concentrates for less acute and for chronic deficiencies. Thousands of lives were saved by taking advantage of research and clinical investigation in protein metabolism during the past decade.

It has been shown that hypoproteinemia produces a delay in the healing of experimental wounds in dogs and rats and in the healing of fractures in rats. Also, rats on low protein diets suffered fractures when less force was applied than was necessary to fracture the bones of rats on a high protein diet. In human beings a high incidence of delay in wound healing and in postoperative wound disruption has been noted in hypoproteinemic patients in contrast to a low incidence in normal patients. Failure of skin grafts has been associated with depleted protein reserves.

Resistance to infection is markedly reduced in hypoproteinemic dogs and it was noted that when infection had developed, the regeneration of plasma protein became much more difficult to obtain.[3] It is believed that the occurrence and outcome of postoperative infections in human beings frequently depend on the immune substances in the plasma and tissue proteins and thus upon the nutritional state of the patient.

The evaluation of protein deficiency in surgical patients is not simple.[4] The important factors are: (1) the optimum weight of the patient, (2) the present weight, (3) the plasma protein level, (4) the plasma albumin level, (5) the plasma volume, (6) the nitrogen intake, and (7) the nitrogen output. From a clinical standpoint, main reliance must be placed on the nutritional history, on the patient's weight and on the serum protein content determinations. The interpretation of the latter is often difficult because of some acute condition that may occur in a patient with chronic protein deficiency. Vomiting may have produced dehydration and a considerable reduction in blood volume so that the previously low plasma protein level may become normal and give no clue to the fact that the patient is suffering from a serious protein deficiency. Increasing the blood volume by the administration of solutions of electrolytes or by other means may result in the plasma protein concentration falling to low values. In chronic illnesses hypoproteinemia indicates a marked tissue protein deficit, for it has been determined that a loss of 1 gm. of albumin from the plasma denotes a loss of at least 30 gm. of protein from the tissue. Loss of weight as a means of evaluating protein depletion is stressed by several investigators.

Oral surgeons should keep themselves well informed regarding the progress

3. Cannon, P. R.: The Importance of Proteins in Resistance to Infection. J.A.M.A. 128:360, June 2, 1945.

4. Youmans, J. B.: The Clinical Detection of Protein Deficiency. J.A.M.A. 128:439, June 9, 1945.

and development in the management of protein deficiencies in order to provide maximum service to the patients under their care. Protein nutrition has been and is still a much neglected consideration in medical and surgical care. Severe maxillofacial wounds and fractures, with or without a considerable loss of blood, may not only require prompt protein and shock therapy by the administration of plasma, whole blood, etc., but may also require a continued maintenance of optimum protein intake to assure the best possible healing of soft tissues and bone, as well as the maintenance of resistance to local and systemic infection. It might be noted that the effectiveness of sulfonamide or penicillin therapy is greatly impaired when hypoproteinemia is present. This fact is of great importance where patients with cellulitis of the oral and facial tissues or of the fascial spaces of the head and neck are concerned. Unless special effort is put forth, a great reduction in food and fluid intake, owing to the loss of appetite, fever, pain and discomfort on swallowing, may result in protein depletion and delay recovery.

Patients in all age groups and conditions of acute and chronic disease come under the care of the oral surgeon. The indicated surgery may be, for example, multiple extractions in preparation for dentures or immediate denture surgery, etc. Patients who are chronically ill, particularly those who are underweight and suffering with gastrointestinal disease, anemia, diabetes or nephrosis, etc., should be evaluated from the standpoint of their protein balance in addition to the considerations of their specific disease before surgery is undertaken. As most of this surgery is elective, a few weeks of optimum protein dietary management and specific treatment for the chronic condition present will accomplish much in the matter of preventing undue operative and postoperative hemorrhages and will assure the most prompt and least complicated healing of the tissues and the repair of the compound injury of bone incident to the extractions. Continuation of the adequate protein intake will tend to improve and maintain the health of the patient. In the event that an adequate intake cannot be obtained by foods, administration of the "essential" amino acids as protein hydrolysates will effectively maintain nitrogen balance and cause regeneration of serum proteins even when normal digestion and absorption are markedly impaired. These can be taken by mouth or by tube feeding or given slowly by intravenous or subcutaneous injection. Many investigators have concluded that, when a parenteral diet becomes necessary, one is no longer justified in limiting that diet to water, electrolytes, glucose and vitamins. Amino acids should be added to make the mixture more nearly complete.[5]

CARL W. WALDRON.

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5. Elman, Robert: The Practical Use of Amino Acids in Protein Nutrition. J.A.M.A. 128:659, June 30, 1945.

TRISMUS DUE TO MYOSITIS OSSIFICANS TRAUMATICA: REPORT OF A CASE*

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Trismus is a limitation of the movements of the mandible and is due to a contraction and spasm of the muscles of mastication rather than to an affection of the temporomandibular joints. It may be a result of gunshot wounds or other injuries to the muscles. Again, as in the last war, it is being encountered in an increasing number of cases. An uncommon complication is calcification and ossification of the damaged muscle. The latter phenomenon is the subject of this case report.

REPORT OF CASE

History.—A man, aged 21, was admitted with a complaint of inability to open his mouth for the past four months, after sustaining a perforating wound to the right side of his face. There was no history of previous deformity or disability of this region. The entrance wound was in the right cheek on the lateral aspect of the zygomatic arch and traversed the masseter muscle in a downward direction with the exit wound in the neck at about the middle of the right sternomastoid muscle. X-ray films taken immediately after the injury showed no fracture of the facial bones but did reveal small metallic foreign bodies in the right cheek. The patient recalls that there was a minimum of bleeding, but that he experienced an immediate muscle spasm. His jaws closed so tightly that only a liquid diet was possible. This resulted in a loss of weight of about 25 pounds.

Examination.—General physical examination was essentially negative. At the site of entry and exit of the missile, there were well-healed, pliable and non-tender scars about 5 mm. in diameter. There was a diffuse hard mass in the region of the right zygomatic arch which extended downward and backward along the ramus, following the general outline of the masseter muscle. A tender area was palpated in the upper pole of this mass. The maximum amount of opening, both actively and passively, was 4 mm. between incisors, and the mandible deviated to the right in open position (Fig. 1). The rotating motions and the lateral excursions of the mandible produced by the action of the pterygoids approached normal.

X-ray films show a heavy bony overgrowth, extending from the inferior border of the right zygomatic arch down the ascending ramus of the mandible, and some bony reaction at the angle of the right mandible, which represents a myositis ossificans (Fig. 2). In addition, there are two small metallic bodies

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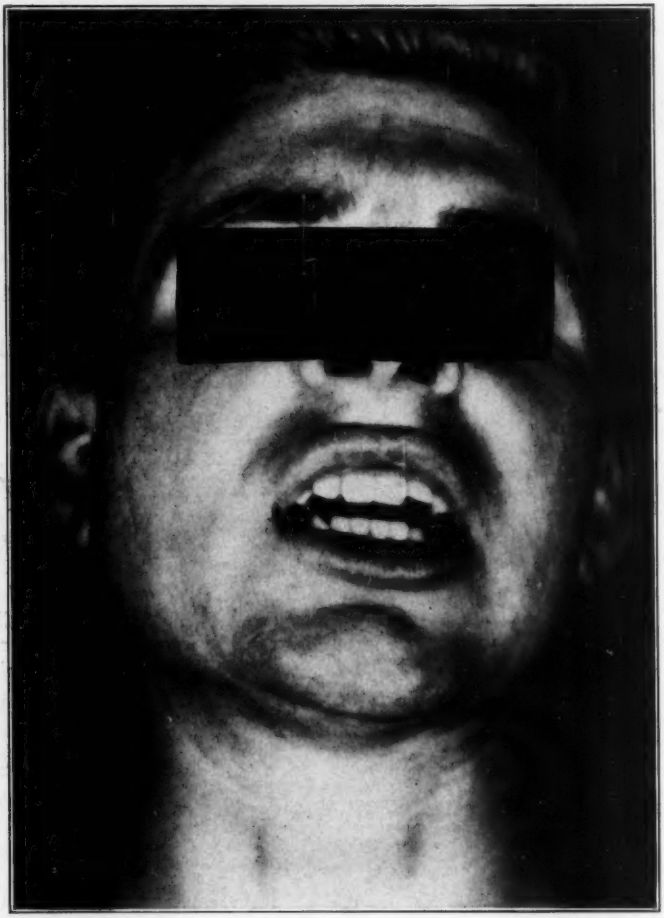

Fig. 1.—Opening of mouth between incisors 4 mm. before treatment. Note asymmetry of face due to mass in right cheek.

seen in the region of the bony mass. Additional films show no abnormality of the temporomandibular joints. A sialogram of the right parotid gland shows Stensen's duct well outlined without evidence of good ramus branching into the superior lobe of the parotid. This, we felt, was due to the atrophy of that portion of the gland secondary to the mass. It was believed that the myositis ossificans was causing distortion of arborization, owing to pressure.

Blood and urine were found to be normal by laboratory examination, and special tests showed serum calcium, phosphorus and phosphatase to be within

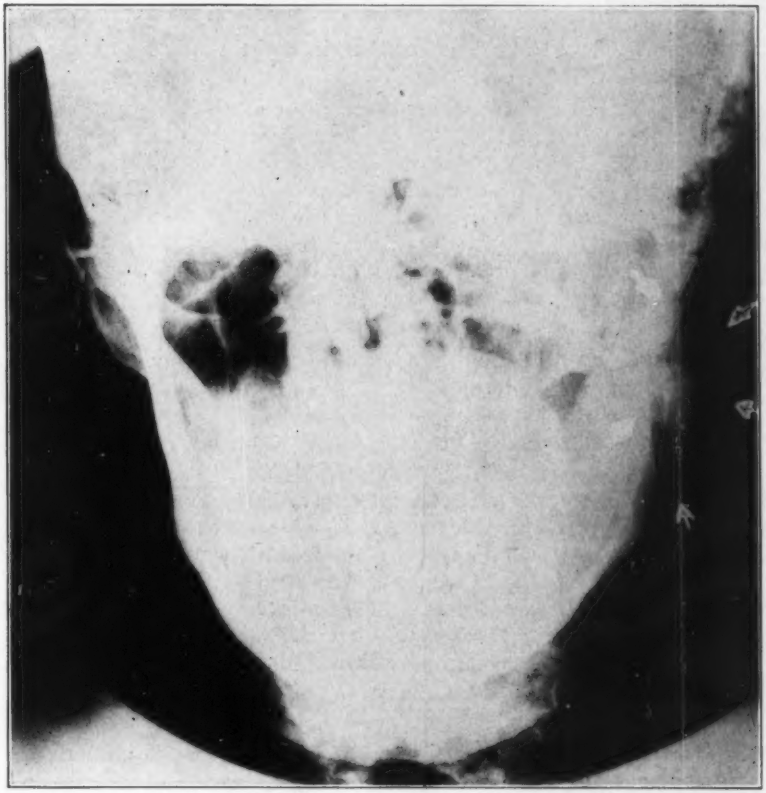

Fig. 2.—Radiograph, showing ossified mass along ramus of right mandible. (X-ray was underexposed to bring out the mass in better detail.)

normal limits. However, during one episode of increased pain, we noted a rise of the serum phosphatase to 9.23 mg. This rise was probably due to bony activity in the lesion.

Diagnosis.—The diagnosis was: 1. Perforating wound of the right cheek and the neck with laceration of the masseter muscle. 2. Trismus due to myositis ossificans traumatica of the right masseter muscle.

Discussion.—Myositis ossificans occurs, for the most part, in the brachialis muscle of the elbow joint and in the muscles of the thigh, but rarely in the muscles of mastication. In the maxillofacial section of the U. S. Army Medical Department reports[1] of the last war, there is recorded a single case

1. Ivy and Eby, Medical Department of the United States Army in the World War, Washington, D.C.: U.S. Government Printing Office, 1924, Vol. XI, Sec. II, p. 457.

of myositis ossificans. Because of the complete trismus, counter-trismus appliances could not be used, and total excision of the masseter muscle was accomplished.

Cameron and Stetzer[2] recently reported a case in which they first excised just the ossified tissue; later, when calcification recurred, they excised the entire muscle; and, finally, they had to resort to a third operation to remove small amounts of recurrent calcification of the tendinous attachments of the muscle.

The masseter muscle is broad and rhomboidal in shape, covering the greater part of the lateral surface of the ramus of the mandible. The superficial and deep portions arise from the lower border of the zygomatic arch and pass downward and backward to insert in the external surface of the ramus. The fibers of the muscle contract slowly but powerfully and provide for the crushing and grinding function of the teeth as well as for the elevation of the mandible.

It is not difficult to explain the pathogenesis of this case of myositis ossificans of the masseter muscle, for the conditions necessary for heterologous bone production are present: (1) the muscle fibers, torn and bruised by the bullet wound, lost their blood supply and degenerated; (2) an intramuscular and possibly a subperiosteal hematoma was formed; (3) the periosteum of the ramus was irritated and stimulated. Instead of going through the usual phases of resolution, the hematoma, in the presence of these factors, went through the process of tissue repair, namely, fibrosis, calcification and finally ossification. This preosseous substance in the masseter musele naturally interfered with the normal movements of the mandible and produced the trismus.

Treatment.—Restoration of the masticating function so that the patient could comfortably eat an average diet was our primary objective. To accomplish this end, a mode of increasing the opening of the mouth was sought. There was a choice of one of two approaches: (1) the radical method, which would necessitate the surgical excision of the bony mass itself or the removal of the entire muscle or (2) the more conservative method of gradual opening of the mouth by a counter-trismus appliance.

It has been the experience of the orthopedic surgeon that the removal of the ossified mass per se in a myositis ossificans of the brachialis muscle is inadequate, for the lesion will recur. This is particularly true if the process of ossification is still an active one. Such a lesion requires nine months to a year to reach its maximum growth and become dormant. In the light of the history of only four months' duration and the tenderness of the lesion as reported in the case history, surgery was felt to be contraindicated. The radical procedure of total excision of the muscle did not seem expedient without first attempting the more conservative method.

2. Cameron, J. R., and Stetzer, J. J.: Myositis Ossificans of Right Masseter Muscle: Report of a Case, J. Oral Surg. 3:170-173, April 1945.

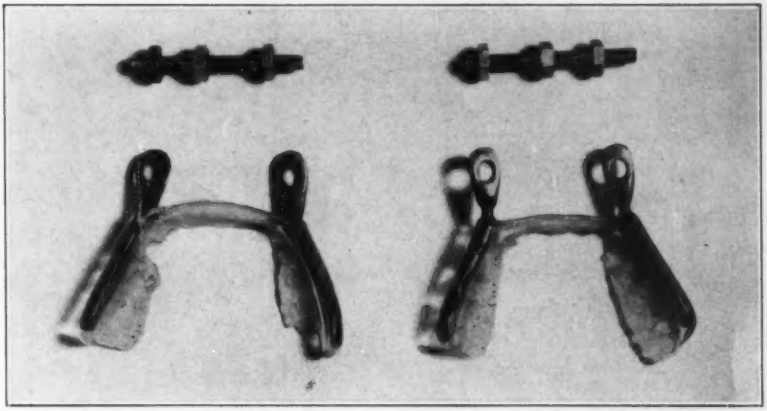

Fig. 3.—Acrylic screw-gag counter-trismus appliance.

Our conservative treatment consisted of a counter-trismus appliance and appropriately sized rubber stoppers. The appliance accomplished several things. First, it provided for a slow gradual stretching of the contracted adhesions in the muscle. Second, a relative degree of immobilization could be maintained. Immobilization was necessary to stop the progressive process of calcification and ossification, for the stimulation of motion would traumatize the muscle fibers adjacent to the calciferous deposits and promote further bone formation, thereby initiating a vicious cycle. In addition, Leriche and Policard[3] state that resorption of excess new bone is greater if the part is immobilized. Third, the appliance did not interfere with normal circulation to the part and thus permitted nature to use its maximum powers in gradually resorbing excess new bone.

The appliance consisted of a removable acrylic splint covering the occlusal and buccal surfaces of the teeth (Fig. 3). Incorporated in the buccal surface of the splint was a rod for each quadrant of the mouth, constructed so as to protrude 1 cm. in front of the cuspid teeth. A bolt was passed through parallel holes in the protruding rods. The length of the bolt could be increased or decreased by adjusting the nuts. Thus, by increasing the length of the bolt, the appliance could be made to exert a slow, steady pressure and to produce a gradual increase in the amount of opening of the mouth (Fig. 4).

The patient was instructed how to remove the appliance and clean it. The appliance was worn continuously, except at mealtime. Adjustment of the nuts to increase the mouth opening was made by the patient under dental supervision each day, and the amount of adjustment was determined by his toleration and comfort. After the patient had used the appliance for three weeks, several of

3. Leriche, R., and Policard, A.: Normal and Pathological Physiology of Bone: Its Problems (English translation by Sherwood Moor and J. Albert Key). St. Louis: C. V. Mosby Co., 1928.

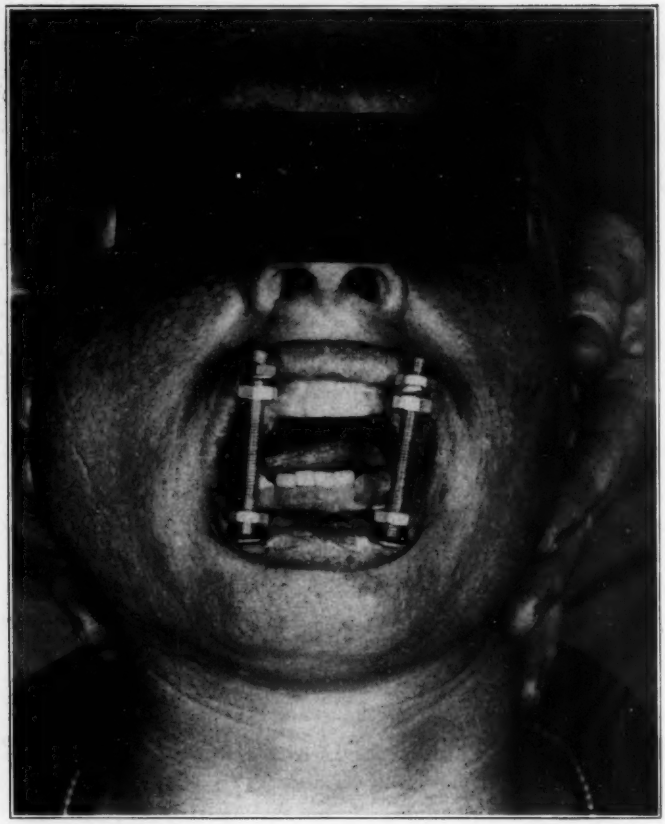

Fig. 4.—Appliance in position.

his teeth became sensitive from the constant pressure. Therefore, the appliance was removed. To maintain the opening which was gained, a rubber stopper, which was more readily tolerated than the appliance, was wedged between nonsensitive teeth. Increase in the opening was also continued by using successively larger stoppers (Fig. 5).

The treatment resulted in a gradual increase in the mouth opening from 4 mm. to 21 mm. by active pressure of the counter-trismus apparatus (appliance or rubber stoppers). Passively, i.e., by the voluntary use of his muscles, the patient could open his mouth to 16 mm. (Fig. 6). He still experiences a slight amount of discomfort in the movements of the mandible, but he complains of no pain in the lesion itself. By small amounts of muscle exercise, he should regain at least partial use of the affected masseter muscle. Our primary objec-

Fig. 5.—Rubber stopper in position.

tive of restoring the masticatory function has been accomplished, for the patient states that he once again can eat an average diet and that he has regained his lost weight. Whether this restoration of function is of temporary or permanent nature will be tested by time.

Prognosis.—The prognosis of this case is fair. If the myositis ossificans remains dormant and is not stimulated by trauma to involve more of the affected muscle, the patient should be able to carry on his daily routine without difficulty. It is anticipated that diminution in the size of the mass will take place, if at all, over a period of years. The slight asymmetry of the face is negligible. On the other hand, if further involvement of the muscle produces interference with proper masticatory function, total surgical excision of the muscle will be indicated.

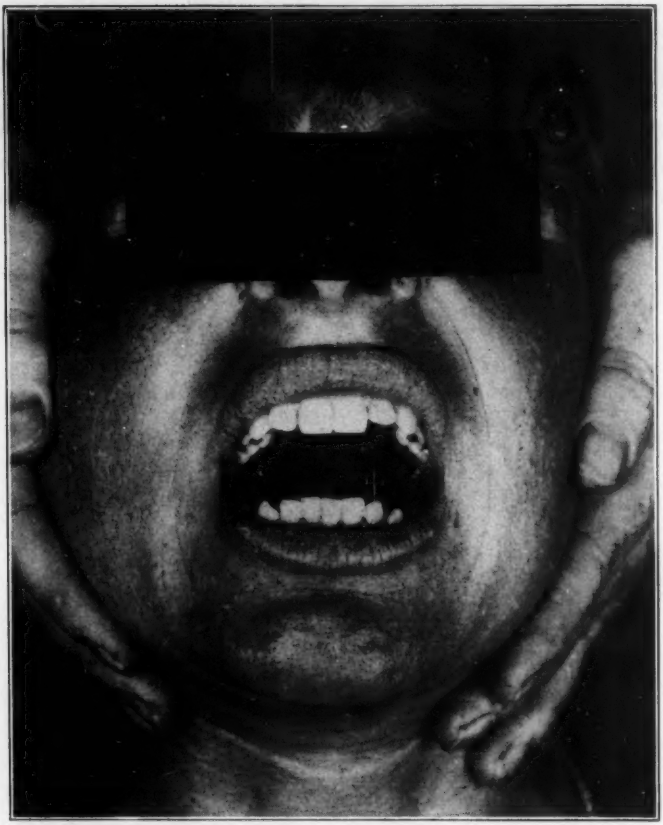

Fig. 6.—Opening of mouth between incisors 16 mm. after treatment.

COMMENT

We are reporting this case because, first, such a complication as myositis ossificans traumatica in the masseter muscle has rarely been found and recorded in the literature, and, second, we wanted to bring to the attention of the maxillofacial and dental surgeon a complication which might be anticipated.

We would like to suggest that, in cases where there is an ossified mass in the masseter muscle, trismus might be prevented by relative immobilization of the jaw in an open bite position. The purpose of immobilization is to put the part at rest, minimize infection, limit hemorrhage and prevent

further irritation of the lacerated muscle. Healing is promoted and heterologous bone formation prevented or at least kept to a minimum. The open bite position minimizes contraction deformity and allows the patient's food intake to be more adequate, thus maintaining the body weight. Incidentally, in case of nausea and vomiting due to injuries or intercurrent illness, an open mouth allows for egress of stomach contents without danger of pulmonary complications due to aspiration. After the patient has received maximum benefit from immobilization in open bite position, restoration of muscle function can be accomplished by exercise.

We feel that radical excision of the affected muscles should be done only after conservative methods such as described here have failed to restore an adequate masticatory function.—*6 Fuller Street, Brookline, Mass.*

Myositis Ossificans of the Masseter: Report of a Case.—The patient was wounded by a small shell fragment which entered the face over the left malar process and traversed the masseter muscle, stripping up the periosteum over the outer surface of the ramus of the mandible. The radiograph demonstrated a myositis ossificans of the masseter, and showed the small shell fragment at the posterior edge of the ramus. There was total inability to move the mandible. A semi-circular flap incision was made over the ramus, and the entire ossified masseter muscle excised, permitting opening of the jaws to full extent. The trismus apparatus which was inserted after the operation, maintained the space thus gained.—*Ivy and Eby: The Medical Dept. of the United States Army in the World War. II: Sec. 2, p. 457.*

The April issue of the JOURNAL OF ORAL SURGERY will be received late by its subscribers owing to curtailment of printing schedules resulting from the coal strike. This unavoidable delay is regretted by the Editor.

REMOVAL OF MULTIPLE IMPACTED TEETH: REPORT OF A CASE

LOUIE T. AUSTIN,* D.D.S., Rochester, Minn.

History.—A woman, aged thirty years, registered at the clinic on November 26, 1935 and was referred to the dental section for examination during the course of the general examination. She gave a history of being unable to obtain satisfactory dental services because of a number of impacted and unerupted teeth.

Examination.—Clinical examination of the teeth revealed that they were irregularly spaced and that some were absent. Dental roentgenograms showed several unerupted teeth, around most of which cysts were beginning to form (Fig. 1). In the upper jaw, the cuspids and a supernumerary left cuspid as well as the right third molar had failed to erupt. A deciduous right cuspid was in position. In the mandible, the teeth were in greater malposition than in the maxillae. Teeth that had failed to erupt in the mandible were the third molars, a left second bicuspid, the cuspids, supernumerary cuspids and the right first bicuspid. Although the presence of many unerupted teeth was suggestive of cleidocranial dysostosis, the roentgenograms of the other bony structures in the body did not reveal the associated defects pathognomonic of this syndrome. Other laboratory studies did not disclose anything of significance. Removal of the unerupted teeth was advised. Because of the number of teeth to be removed, and the fact that all parts of the jaws were involved, it was thought best to employ several sittings for the dental operations and to disturb only one quarter of the mouth at each.

Operations.—On December 3, 1935, the patient was hospitalized. Local anesthesia was induced for the removal of the upper right cuspid and third molar. The coronal portion of the unerupted cuspid was exposed by means of a mucoperiosteal flap on the palatal surface and removal of the overlying bony process. The crown of the tooth was split off by means of a chisel and the root was removed with elevators. The unerupted upper third molar was exposed in the same manner and removed with elevators. The postoperative course was without difficulty.

On December 13, 1935, the patient was hospitalized a second time and local anesthesia was again induced for removal of the upper left cuspid and a supernumerary cuspid. The crowns of both teeth were lying in a cavity filled with thick, yellowish pus-like material. The exposure was made from the palatal surface and the teeth were removed in the same manner as was the upper right cuspid. The supernumerary cuspid apparently had perforated the bony floor of the nose but the maxillary sinus was not involved. Following this procedure the postoperative course was uneventful.

*Section on Dental Surgery, Mayo Clinic.

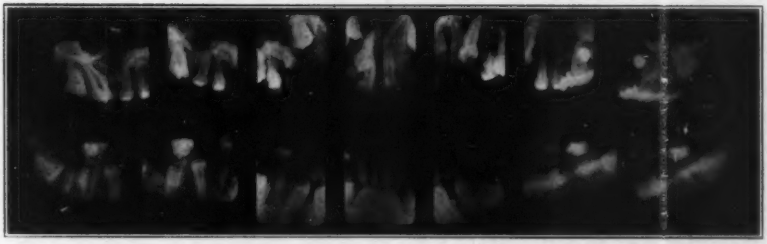

Fig. 1.—Preoperative dental roentgenograms in a case in which there were several unerupted teeth.

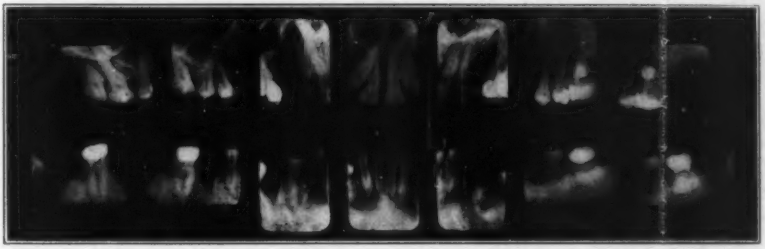

Fig. 2.—Postoperative dental roentgenograms.

On December 20, 1935, the patient was hospitalized again and local anesthesia was induced for removal of the lower left third molar, the lower left second bicuspid, the lower left cuspid and a supernumerary cuspid. After exposure of the crown of the lower left third molar, the distal cusps were split off and the tooth was rotated upward and backward with a LeCluse elevator. The bicuspid tooth was removed by means of an incision through the soft tissues along the crest of the ridge. The lower left cuspid and the supernumerary cuspid in the left side of the mandible were removed through a crescent-shaped incision on the labial surface in the region of the two teeth. After the coronal portions of these teeth were exposed, it was observed that they were lying in the same cystic cavity with a fistulous tract extending upward to the crest of the ridge. The coronal portions of these teeth were split off with a chisel and removed together with the membranous lining of the cavity and the fistulous tract. The root ends were removed by means of elevators. The soft tissues were closed with catgut sutures. The postoperative course was again uneventful.

On December 31, 1935, the patient was hospitalized once more and a local anesthetic was given. The lower right cuspid, a supernumerary cuspid in the same part of the jaw and the lower right third molar were removed in the same manner as were the teeth on the opposite side of the lower jaw. The unerupted lower right first bicuspid was lying buccal to the second bicuspid which was rotated but which otherwise was in a reasonably normal position. The operative procedure was similar to that employed in removal of the other lower cuspids.

Course.—The patient was dismissed from the hospital the day after each operation. Roentgenograms were made (Fig. 2) after the operation and the patient was dismissed from my care on January 16, 1936. She has reported since that a satisfactory restoration of her missing teeth has been made.—*Mayo Clinic.*

Plastic and Reconstructive Surgery.—Now again, reconstructive surgery has enlisted in a war. Never before have so many devices been created to shatter and maim the human body. Never has the need for skilled plastic surgeons been so great. Yet we are fortunate to have had, ready to tap at the outbreak of World War II, a reservoir of well-trained men who have already done much excellent work. With high-speed transportation bringing the most serious war casualties back to America, plastic surgeons here are in a sense working in the emergency atmosphere of a front-line hospital. Lack of time is our most severe handicap. Always under pressure, we have little opportunity for scientific experiment or for a choice between alternative techniques. We must depend upon the reliable, known methods. Plastic surgery, with two wars and a twenty-year interval of peace as its proving-ground, has progressed to a point of certainty where it can begin to meet, adequately, the heavy demands placed upon it today. With each year of growth it has come into a sharper focus of public interest. Not only men-under-arms, but laymen in ordinary walks of life are conversant with the terms of plastic and reconstructive surgery. As always, when any comparatively new thing still has news value, it is the spectacular, whether true or false, that appeals to the imagination. Plastic surgery is no exception. Unless plastic surgeons make an effort—to put it plainly—to "de-bunk" with facts some of the fallacious beliefs existing in the minds of many people, we may find ourselves placed upon the uncomfortable pedestal of being "miracle-makers"; "miracle-makers" who, unfortunately, cannot perform all of the miracles demanded of us. One of the most pernicious and persistent of such fallacies, which currently enjoys a good deal of credence, concerns just how "perfect" a restorative job even the ablest reconstructive surgeon can do. . . . We can, it is true, make our disfigured service man better—better, perhaps, than he can reasonably expect to be. But we cannot erase all the marks of his catastrophe and we have no right to let a misinformed public hold out to him the hope that we can perform the impossible.—C. R. Straatsma, *Mil. Surgeon,* March 1945.

ADAMANTINOMA OF THE MANDIBLE: REPORT OF CASE*

KENNETH W. PENHALE, M.D., D.D.S., Chicago, Ill.

History.—A negro woman, aged 43, was admitted to the hospital with a complaint of pain and pain only, of two weeks' duration, in and around the lower right second bicuspid tooth. The patient's family history was essentially negative.

Clinical Examination (right mandible).—No external swelling could be detected. There was a slight thickening of the right mandible from the buccal to the lingual surface. The mandible was firm on palpation. The first and second molar teeth were missing and the third molar was rotated lingually.

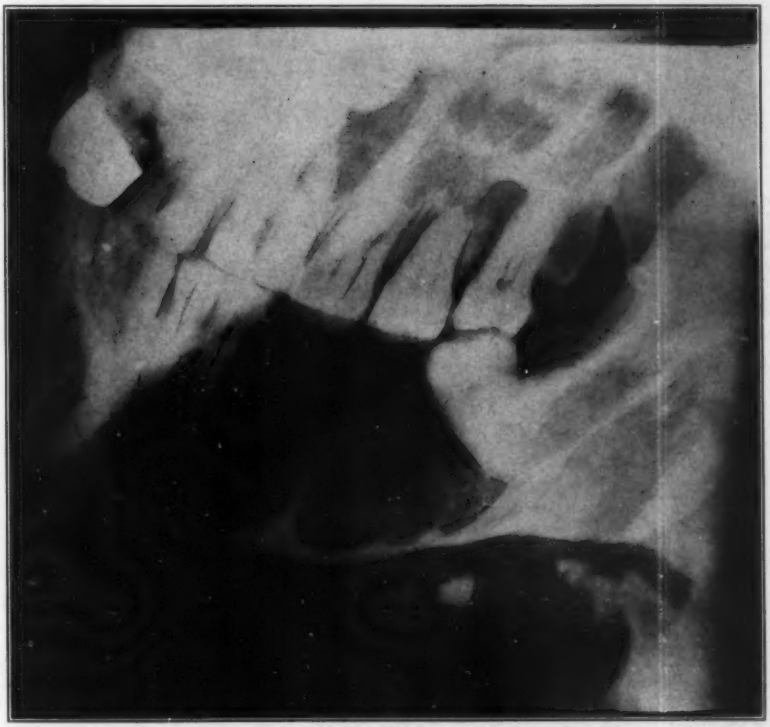

Fig. 1.—Print of preoperative right lateral jaw x-ray film showing marked destruction of bone.

*From Cook County Hospital, Chicago, Ill.

Fig. 2.—Print of right lateral jaw x-ray film taken two years after operation, showing definite evidence of bone regeneration.

Diagnosis.—A clinical diagnosis of an adamantinoma was made and confirmed by x-ray examination (Fig. 1) and by microscopic study of sections made.

Preoperative Precaution.—Because of the size of the tumor and the possibility of a pathologic fracture, an acrylic splint was constructed and cemented to all teeth present. The second bicuspid tooth was removed.

Operation.—Under morphine and scopolamine and a mandibular block injection of 2 per cent procaine and adrenalin, 1/100,000, an incision was made from the left canine tooth to the third molar, under and to the buccal surface of the splint.

A radical window was made into the tumor mass by retracting the periosteum and biting out the cortical plate with a rongeur. The entire tumor mass was shelled out. Bone wax was forced into the mandibular canal posteriorly, controlling most of the bleeding.

The entire cavity was inspected and cauterized, where it was believed necessary, by electrical desiccation. The cavity was then packed lightly with vaseline gauze.

Postoperative Treatment.—The gauze was changed daily for several days to keep the entire cavity free from saliva. The splint was removed on the

eighteenth day following the operation. Four x-ray examinations were made during the next two years (Fig. 2).

Results.—To date (over three years following the operation) there has been no evidence of recurrence. The patient is to return at least once a year for x-ray examination.

Microscopic Description.—Sections of the tumor mass revealed portions of the tissue to be composed of numerous cores of typical squamous epithelium surrounded by columnar enameloblasts. Intermixed with these, and in separate areas, were bands of spindle shaped, dark staining columnar cells (enameloblasts). The bands of enameloblasts were from two to four cells in width. The cores and bands of cells were separated by a fine loose fibrous stroma. There were occasional lymphocytes throughout and some focal areas of lymphocytes. As this contained enameloblasts and mature epithelium, it was a typical adamantinoma (adamantoblastoma or ameloblastoma). This adamantinoma was of the acanthoma type.—*55 East Washington Street.*

Personality Disintegration Following Nitrous Oxide Anesthesia.—Fletcher studied twenty-nine cases of personality disintegration following the use of nitrous oxide. Nervous and mental residuals following nitrous oxide anesthesia persisted for many years in one case. Another case illustrated that a small quantity of nitrous oxide given repeatedly may have a cumulative effect and lead to severe disintegration of the personality. A single administration of nitrous oxide, apparently unaccompanied by respiratory difficulties, may result in serious nervous and mental impairment with personality changes. One of the patients, who was nervously unstable, suffered from mental impairment following nitrous oxide anesthesia. It is reasonable to believe that such inherent constitutional weakness would be enhanced by nitrous oxide. The author regards anoxemia as the etiologic factor of the disturbances caused by nitrous oxide. The problem of anesthesia and anoxia may be related to problem children in school. A general anesthetic, frequently nitrous oxide, is employed for the removal of tonsils, adenoids and teeth of children of all ages. Many perplexing problems of the schoolroom may possibly be explained on this basis.—*J. Nerv. & Ment. Dis.* **102**:392, October 1945, via *J.A.M.A.* **130**:113, January 12, 1946.

EXTENSIVE CYSTIC TUMORS OF THE MANDIBLE: REPORT OF CASE

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Minneapolis, Minn.

The rapidity of growth of odontogenic cysts of the jaws is but rarely determined in the individual case and probably varies considerably in different individuals as well as in the same individual. The date of a traumatic injury to a tooth, the insertion of a deep silicate cement filling or the devitalization of a tooth may afford an approximate estimation of the length of time required for a cyst to attain a certain size. Early diagnosis is essential to prevent extensive loss of bone, the resorption of tooth roots and encroachment on the floor of the nose, the maxillary sinus and the palatal processes in cysts of the upper jaw.

Several methods of treatment have been proved satisfactory, including complete enucleation and suturing; enucleation and dressing of the cyst cavity until healing has approached the surface, and the Partsch operation, which, except for the window approach, leaves the cyst wall intact and undisturbed in order to protect the root ends of teeth, the floor of the nose or the maxillary sinus. In some instances, combined enucleation of a portion of the cyst, together with a Partsch procedure to protect and save certain strategic teeth, is the method of choice.[1] More recently, Schram[2] and his associates[3] reported their clinical experience with complete enucleation and the implantation of synthetic bone paste to fill the cyst cavity, followed by accurate tight suturing of the incision margins. Their conclusions were that the salts were well tolerated by the tissues and their use had no unfavorable reactions. As compared with the control cases, in which suturing was done without the implantation of bone paste, the cases reported presented slightly less pain and swelling, acceleration of bone regeneration and better color and texture of the soft tissues over the operative area in the implanted cases. The eventual contour of the region was much better when bone paste was implanted. This method merits further investigation and evaluation to determine the indications for its use in the individual case.

It is obvious that there are several facts that should be considered before determining the treatment. Among the more important are correlation of

1. Waldron, C. W.: Cystic Tumors of Jaws. Am. J. Orthodont. 27:313, June 1941.

2. Schram, W. R., and Fosdick, L. S.: Studies in Bone Healing. J. Oral Surg. 1:191, July 1943.

3. Weil and Ely: Effect of Mineral Salt Bone-Paste on Bone Regeneration. Northwest. Univ. Bull. 44:12, December 4, 1944.

findings of the local examination regarding the condition and usefulness of the involved teeth with respect to the ultimate dental restorations to be made. The age should also be considered, for it is obvious that a young person presenting a large cyst of the mandible encroaching upon the molar and bicuspid teeth with a full complement of molar and bicuspid teeth on the opposite side should have the affected teeth preserved for future usefulness when the alveolar support is adequate and there is no gingival or other infection. The encroachment of an enlarging cyst upon the roots of teeth even to the extent of causing marked resorption of the root ends does not devitalize the pulp, but causes changes that are probably due to a slowing up of the circulation of the pulp due to pressure of the cyst upon the vessels. When the teeth on the opposite side are missing or should be extracted, enucleation of the cyst wall and removal of the involved teeth, rather than the Partsch procedure, is indicated in that regeneration of bone will be more rapid and a more satisfactory dental restoration may be anticipated.

REPORT OF CASE

History.—A man, aged 40, in 1931 was referred for operation on a cystic area in the mandible, left side. There was almost no dental complaint, but, on questioning, the patient stated that now and then he had a neuralgic type of pain behind the ramus of the jaw extending up over the ear and temporal region, but of short duration and recurring only at long intervals. On the left side, the first molar was missing. The patient stated that this was removed about 1920. He thought that the tooth was abscessed, and that the granuloma came away with the tooth.

Examination.—Small x-ray films showed a large cyst extending from beneath the second bicuspid to a point beneath the third molar, at which there seemed to be a septum of bone. Distally from this, there was another dark area. (Fig. 1.) A lateral film of the jaw showed that this area extended upward to the very base of the coronoid process and backward to the neck of the condyle. The posterior part of the cystic area was somewhat irregular and scalloped. The anterior part was circumscribed and oval in outline. (Fig. 2.) A small dental film taken in 1926 showed an area beneath the second and third molars with an apparently normal alveolar process in the first molar extraction area. (Fig. 1.)

Careful examination of the 1926 dental x-ray films did not disclose the site of origin or the type of cyst. The presence of two similar, but separate areas distally from the crown and the distal root of the third molar indicated that the cyst may have originated in the ramus. This was further suggested by the fact that the periodontal membrane and lamina dura shadows of the molar root ends were apparently normal and the teeth were apparently vital. Since that time (five years), the cyst had obviously developed forward, destroying a portion of the roots of the second molar, and extending past the first molar area to cause resorption diagonally of the end of the root of the bicuspid.

Operation.—December 1931, under procaine anesthesia, left mandibular, lingual, long buccal and buccal infiltration, a section of the buccal alveolar

Fig. 1.—Bicuspid and molar region, August 1926 (above) and December 1931 (below); showing extension of the cystic area through the alveolar process of first molar region to encroach on and resorb the root end of second bicuspid tooth in addition to resorbing the root ends of first molar.

Fig. 2.—Lateral jaw x-ray film showing extent of tumor in body and ramus of mandible.

process in the first molar region was removed with a chisel and a large cyst opened into. From this came a yellow fatty exudate. An attempt was made to get the membrane lining to this window of bone removed, but the membrane was so friable and loose that it was pushed back by the chisel. The window was then extended distally, and the bone cut with a frontal sinus punch. The cyst wall was dissected free and was found to be rather painful on the buccal aspect. The wall, on elevation, was found to have incorporated in its surface the inferior dental nerve, which was lifted freely from the lower part of the cyst cavity.

The cyst wall was then dissected free from its upper and anterior part and then dissected backward off the inferior dental nerve. The first bicuspid and the second molar were extracted after interproximal relief with chisels. The buccal bony wall was cut farther back with punch forceps and relief given to remove the third molar. This, when extracted, had attached to it the posterior part of the cyst. Some of the nerve branches to the teeth were torn off. At first, it was thought that the nerve had been severed, but examination of the cyst wall showed that the nerve was intact and that it was exposed for approximately 1 inch in the molar region, where it entered a bridge of bone and again came in view in the lower part of the ramus.

Dissection was continued to expose the anterior portion of the ascending ramus and the coronoid process up to the tip. Using punch forceps and chisels, this part of the ramus was opened to its full diameter, which was only about 3 or 4 mm. The yellow exudate was removed from this second ascending ramus cyst. The area was found rather tender. Cocaine solution and cocaine crystals were applied. The wall was then dissected free from the bony cavity, and it was found that the nerve ran under a second bridge of bone and again was exposed high up as it coursed over to the lingual side.

In tearing away the cyst wall from the anterior cystic area, with the extraction of the third molar, it was a little difficult to determine whether there were two cysts present or there was a constriction in the partition between the anterior and posterior areas. The cyst walls removed were very thin in practically all parts, that of the ascending ramus cyst being thinner than the wall in the body of the jaw.

Laboratory Data.—Pulp: Many calcific bodies were present, representing constructive changes. The larger masses stained with eosin in the center and with hematoxylin around the periphery. This means that the centers, or older portions, were osteoid and the surrounding portions were made up of calcium salts. There was an indefinite arrangement of pulp cells around some of the calcific masses. The smaller calcific masses were composed entirely of calcium salts laid down in the tissues. The coronal two-thirds of the pulp contained, besides these masses, varying scarred areas distributed throughout without special reference to the position of the calcific bodies. The capillaries in the portion of the organ nearest the occlusal surface of the tooth were numerous and engorged. The odontoblastic layer appeared to have reverted in type almost to the young connective tissue from which it came. (Fig. 3).

Course.—The postoperative course was uncomplicated. After the second postoperative dressing, at three-day intervals, the patient was permitted to

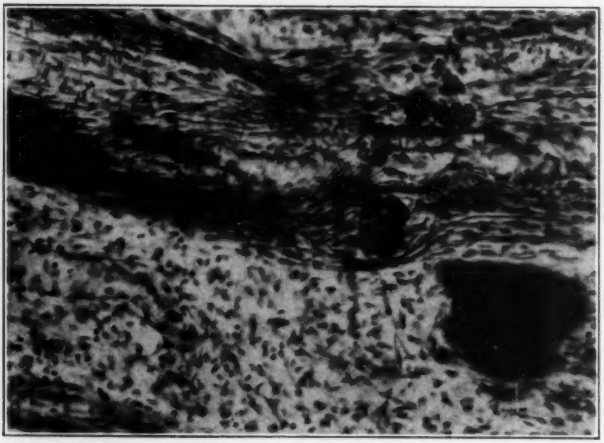

Fig. 3.—Photomicrograph of the pulp of a tooth whose root end was resorbed, showing masses of osteoid tissue and calcium salts along with evidences of scarring. Sections of the cyst wall showed no unusual characteristics.

return to his home, and subsequent dressings were taken care of by his own dentist. These were continued for approximately three months, at which time there remained a shallow depression in the buccal surface of the molar ridge and the cyst cavity had become closed by granulation. The patient was not seen again until October 1936, when x-ray examination revealed complete regeneration of the mandible. (Fig. 4.) He was not wearing any dental prostheses to substitute for the missing teeth on the left side, as such a unilateral partial restoration would not offer much hope for successful use. Examination was not made to determine whether the unilateral occlusion had resulted in any temporomandibular symptoms or findings.

SUMMARY

This case is of interest in that the choice of the method of treatment was not considered on the basis of the presence and the condition of the bicuspid and molar teeth on the opposite side of the mandible. The more radical enucleation of the entire cyst wall, along with the removal of the teeth involved, was incorrectly chosen rather than the conservative Partsch procedure, which would undoubtedly have saved the teeth for future usefulness. Because the cyst of the ramus had produced little if any transverse enlargement of the ramus, but had rather produced resorption of its interior, a Partsch exposure of the ramus cyst would have made the dressings more difficult for a sufficient length of time to allow for complete filling up of the ramus portion of the cystic area. Therefore, a combined procedure including the enucleation of the cyst wall from the ramus area, with a Partsch window

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Fig. 4.—Lateral jaw x-ray film five years after operation, showing complete regeneration of bone.

procedure below the molar and bicuspid region, would have been the method of choice. The microscopic examination of the pulps from the resorbed teeth certainly justifies the Partsch procedure in cases of such marked resorption when the teeth are firm and free from gingival infection in order to retain them for service and thus avoid the difficult problems of unilateral prosthetic restorations.—*950 Medical Arts Building.*

MEETING OF AMERICAN BOARD OF ORTHODONTICS

The 1946 meeting of the American Board of Orthodontics will be held at the Broadmoor Hotel, Colorado Springs, Colorado, September 26, 27, 28 and 29. Orthodontists desiring to be certificated by the Board may obtain application blanks from the Secretary, Bernard G. deVries, 705 Medical Arts Building, Minneapolis 2, Minnesota.

PAGET'S DISEASE INVOLVING THE MAXILLA AND THE MANDIBLE: REPORT OF A CASE

EDWARD C. STAFNE,* D.D.S., Rochester, Minn.

Paget's disease is a disease of the skeleton which usually occurs after middle age. It may be limited to a part or all of a single bone, but, in the disseminated form, may involve almost all the bones. Involvement of the maxilla and mandible is not uncommon for it has been found that there is definite roentgenologic evidence of the disease in the jaws of about 17 per cent of cases.[1] Involvement of both jaws in the same person occurs rarely. The advanced and progressive forms of the disease often are accompanied by deformities and fractures, and extensive involvement of the jaws is characterized by an increase in size of the dental arch, deformity and malocclusion.

In Paget's disease there is an alternating process of resorption and deposition of bone. In the early stages osteoporosis is the dominant feature and in the advanced stage osteosclerosis is predominant. The roentgenographic appearance is therefore dependent on the stage at which the disease is seen. In the early stage the roentgenograms of the jaws reveal osteoporosis and an absence of the lamina dura in the involved regions, and, in the advanced stages, osteosclerotic bone and often evidence of marked deposition of hyperplastic cementum on the roots of the teeth. The presence of hypercementosis in Paget's disease has also been observed by Cahn,[2] Rushton[3] and Seldin.[4] This hypercementosis is a characteristic feature, and, when present, is of value not only in arriving at a diagnosis of Paget's disease but also in eliminating osteoma and other bone diseases which may involve the jaws.

REPORT OF CASE

History.—A man, 43 years of age, a tailor by trade, came to the clinic for a general physical examination. He had no particular complaint other than a backache of two years' duration which was present only when he was working at his sewing machine. Complete dental roentgenographic examination revealed

*Section on Dental Surgery, Mayo Clinic.

1. Stafne, E. C. and Austin, L. T.: A Study of Dental Roentgenograms in Cases of Paget's Disease (Osteitis Deformans), Osteitis Fibrosa Cystica and Osteoma. J.A.D.A. 25:1202, August 1938.

2. Cahn, L. R.: Paget's Disease of Bone. Arch. Clin. & Oral Path. 1:141, 1937.

3. Rushton, M. A.: The Dental Tissues in Osteitis Deformans. Guys Hosp. Rep. 88:163, 1938.

4. Seldin, N. A.: Paget's Disease: A Clinical Case. Dental Cosmos. 75:691, July 1933.

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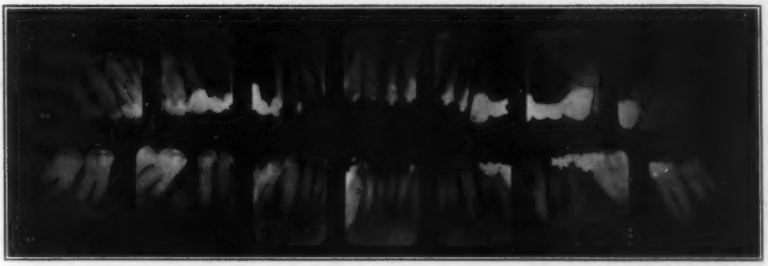

Fig. 1.—Dental roentgenogram showing a case of Paget's disease involving the maxilla and mandible.

a transformation of bone cancellations in both jaws, particularly marked in the anterior regions and the posterior regions on the left side of both the maxilla and mandible (Fig. 1). In the anterior region of the mandible there was marked radiolucency which was probably evidence of the active resorptive phase of the disease, and, in the molar regions on the left, increased radiopacity as a result of excessive deposition of bone. The characteristic feature of Paget's disease which sets it apart from other diseases involving the bones of the jaw is the deposition of hyperplastic cementum on the roots of the left maxillary first molar, left mandibular cuspid and second molar. This evidence in itself warrants a tentative diagnosis of Paget's disease.

Examination.—On clinical examination definite enlargement of the mandible was found in the molar region on the left although the patient was unaware that any change had taken place. Other roentgenograms revealed that the disease also involved the head, sacrum, pelvis, right femur and lumbar vertebrae. The value for serum calcium was 9.8 mg., that for serum phosphorus was 3.4 mg. and that for serum phosphatase was 33.4 units (Bodansky) per 100 cc.

Diagnosis.—A diagnosis of Paget's disease of the bones was made on the basis of the roentgenologic and blood chemistry findings.

Discussion.—The dental roentgenogram has often revealed changes in bone which have led to a diagnosis of unsuspected generalized bone diseases. It may also be an aid in the investigation of suspected cases of generalized bone disease, and in Paget's disease there are certain characteristic features which may be of value in the differential diagnosis. The case under discussion is of particular interest from a dental standpoint because in this patient the maxilla and mandible were both involved.—*Mayo Clinic.*

CONSERVATIVE TREATMENT OF DENTAL ROOT CYST: REPORT OF CASE

LOUIE T. AUSTIN,* D.D.S., Rochester, Minn.

History.—A boy, aged fifteen years, was referred because of swelling in the left upper jaw, probably secondary to dental infection. On examination considerable swelling of the left maxilla was found. This was of six months'

Fig. 1.—Swelling of the left side of the face.

duration and gradually had become larger. Teeth in the left side of the upper jaw were malposed and there was a definite bulging of the bony process above them (Fig. 1). The incisal third of the central incisor teeth had been broken off (Fig. 2). The right central incisor was vital and the left one was nonvital and was discolored. The patient did not complain of pain or discomfort. All of the other teeth on the left side responded positively to the vitality test.

Roentgenographic Examination.—A radiolucent area was revealed from the mid-line to, and including, the first molar on the left side and a definite limiting border of the cavity (Fig. 3). The root ends of the teeth appeared to extend

*Section on Dental Surgery, Mayo Clinic.

Fig. 2.—The fractured upper central incisors.

into the cavity. A tentative diagnosis of root cyst was made. General physical examination of the patient was essentially negative.

Surgical Procedure.—On the fourth day following admission the upper left central incisor was extracted. The socket of the tooth (Fig. 4) communicated with a large cystic cavity which was filled with straw-colored fluid. A definite membranous lining of the cavity clinically identified the condition as a root cyst secondary to a pulpless central incisor. An impression of the opening was made with modeling compound and a vulcanite plug was processed. Openings were made longitudinally and laterally through the plug to be inserted in the socket of the tooth in order that continuous drainage might be obtained (Fig. 5*a*). The patient was seen several times after operation and the cavity was washed out at frequent intervals. The vulcanite plug was held in place by the upper lip and was reasonably comfortable for the patient (Fig. 5*b*).

The patient was dismissed with instructions to wear the drain continuously and to remove it only at intervals for cleansing the area. Eventually it was hoped that repair would be complete and suitable dental restoration of the missing incisor could be made.

Course.—Seven and one-half months later a note was received from the patient as well as one from his dentist together with a dental film (Fig. 6)

Fig. 3.—Preoperative roentgenogram.

Fig. 4.—Socket of tooth which communicated with the cystic cavity.

Fig. 5*a*.—Vulcanite plug which was inserted in socket to provide drainage; *b*, vulcanite plug in position.

showing the process of repair taking place and a postoperative photograph of the patient made at the same time (Fig. 7). In their notes the dentist and the patient stated that the swelling subsided gradually, and the teeth had assumed a normal position. They also said that there was no discomfort and that the drainage also was subsiding gradually. Figure 7 indicates that the enlargement has disappeared.

Comment.—Since the root cyst involved a number of teeth and the patient was young, conservative treatment was felt advisable. Similar treatment has been reported by Gwinn,[1] Kazanjian,[2] Russell[3] and others and it was felt that this was the procedure of choice. The patient stated in his communication that

Fig. 6.—Postoperative roentgenogram taken seven and one-half months after operation.

Fig. 7.—The patient seven and one-half months after operation.

it was not difficult to replace the plug if it was left out of the mouth for any length of time. All the teeth have retained their color and vitality and proper occlusion has been restored. It is possible that complete repair may not take place. However, there is evidence that the cavity is much smaller and marked deformity has been avoided. If repair should be incomplete and surgical interference indicated, this can be accomplished at a later time with little disturbance to the patient.—*Mayo Clinic.*

1. Gwinn, C. D.: Conservative Treatment of Cysts. J.A.D.A. 29:1675, September 1942.

2. Kazanjian, V. H.: Treatment of Benign Tumors of the Jaw. J.A.D.A. 28:208, February 1941.

3. Russell, A. Y.: Conservative Management of Bone Cysts in Children and Adults. J.A.D.A. 23:1719, September 1936.

REMOVAL OF TWO MANDIBULAR SUPERNUMERARY TEETH TO ALLOW ERUPTION OF LOWER SECOND BICUSPID

LARRY E. HILL, D.D.S., Chicago, Ill.

History.—A boy, aged 16, was referred by his dentist for consultation, with instructions to do anything necessary to hasten the eruption of the lower right second bicuspid. The dentist had placed a space maintainer hoping to encourage eruption of the bicuspid. The boy had worn this for two years without result other than to maintain the space.

Examination.—Radiograph (Fig. 1) revealed two supernumerary teeth in such positions as to prevent the eruption of the lower right second bicuspid.

Operation.—Under local anesthesia a flap was retracted exposing the bone over the occlusal and buccal surfaces of the submerged teeth. Bone was removed with a hand mallet and chisel to expose the crowns, and the supernumeraries were elevated from their sockets. A small additional amount of bone was removed over the crown of the bicuspid to hasten its eruption. Figure 2 shows the immediate postoperative radiograph.

Postoperative Course.—Healing was uneventful. Figure 3 shows the progress of eruption of the bicuspid three months later. Figure 4 shows the bicuspid fully erupted, two years later. Had the patient accepted orthodontic aid, the tooth could have been placed in perfect position in the arch.—*25 East Washington Street.*

ORAL LESIONS OF GRANULOMA INGUINALE: REPORT OF THREE CASES

EDWARD R. FERRO,* D.D.S., New Orleans, La., and
JOHN W. RICHTER,† D.D.S., B.S., New York, N. Y.

Granuloma inguinale or granuloma venereum is an infectious granulomatous disease which usually invades the inguinal region. The etiologic agent is the Donovan body. This organism, probably a protozoan, was first recognized by Donovan in 1905.[1]

Two investigators have reported on the incidence of extragenital lesions. One, making an analysis of cases appearing in the literature, arrived at the figure of six per cent.[2] Another, working at the Charity Hospital of Louisiana, found only four such lesion among 294 cases.[3]

Oral lesions of the extragenital cases reported seem to be the most common.[4, 5, 6, 7, 8] We are reporting three such cases discovered in adjoining beds in one of the wards of this hospital.

CASE I

History.—A negro man, aged 31, gave a history of a penile lesion of 10 months' duration prior to his admission to the hospital. Six months after the genital lesion appeared, his mouth developed "sores" and his voice became hoarse.

Examination.—On admission to the hospital, the upper lip on the left side

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†Lieutenant Commander (DC) USNR.

1. Donovan, C.: Ulcerative Granuloma of the Pudenda. Indian M. Gaz., 40:414, 1905.

2. Greenblatt, R. B.: Management of Granuloma Inguinale in General Practice. Superintendent of Documents, U. S. Public Health Service, Supplement No. 19, Washington, D. C.

3. D'Aunoy, R., and Von Haam, E.: Granuloma Inguinale. Am. J. Trop. Med., 17:747, September 1937.

4. Ibid.

5. Greenblatt, R. B., Torpin, R., and Pund, Ed.: Extragenital Granuloma Inguinale. Arch. Dermat. and Syph., 38:358, September 1938.

6. Sidlick, D. M.: Granuloma Inguinale of Face and Mouth. Arch. Dermat. and Syph., 15:703, June 1927.

7. Muckenfuss, R., and Brown, J. B.: Granuloma Inguinale with Report of a Case with Oral Involvement. Internat. J. of Orthodontia, 18:988, September 1932.

8. Hunter, R. J.: Granuloma Inguinale with Associated Lesion of Lip, Pharynx and Larynx: Report of a Case. Tr. and Stnd., Coll. Physicians, Philadelphia, 45:455, 1923.

Fig. 1.—The ulcerative type of lesion. In addition to the lip, the buccal mucosa, the pharynx and the vocal cords were involved.

presented a punched out ulcer (Fig. 1) with a smooth, red base that extended into the mouth to include the inner surface of the entire upper lip.

On the mucosa of the cheek there was a raised, rough lesion having a sharply defined reddened border (Fig. 2). It was covered with many papillomatous projections which were lighter in color when compared with the surrounding mucosa. Unlike the skin lesion, where the thin overlying epidermis is excoriated readily, the mucosa remained intact.

The uvula, which was swollen and pushed to one side, and the pharynx were highly inflamed.

Course.—When the patient was examined one month later, cicatricial tissue was observed in the canine region extending from the mucobuccal fold to the gingiva. There were no palpable lymph nodes. Donovan bodies were recovered from the perineal lesion.

Biopsy.—Tissue study of the lips and mucous membrane of the mouth suggested granuloma inguinale.

CASE 2

History.—A negro man, aged 45, stated that, six months prior to his admis-

Fig. 2.—This raised, granulomatous plaque is the result of autoinoculation from an active genital lesion.

sion to the hospital, inguinal and mouth lesions appeared at the same time. He had been treating himself with a mouth wash containing "blue crystals" ($CuSO_4$) which aggravated his trouble.

Examination.—Clinical: The patient presented a large, raw, freely bleeding ulcerating lesion covering the entire lower lip, the left corner of the mouth and a small part of the upper lip (Fig. 3). The entire area was edematous, extremely painful, and covered with thick dark red crusts.

There were a number of raised lesions on the mucosa of the right cheek. These were sharply defined by a reddened border and there were numerous small papules on the surface. One raised area, larger than the rest, extended from the mucobuccal fold near the molar region to the midline of the hard palate.

On the left side the mucosa had a bleeding, burnt appearance but no granulomatous tissue. Cicatricial tissue, discernible in the right cheek, was already

Fig. 3.—The exuberant type of lesion. The patient further complicated his condition by using copper sulfate as a mouth wash.

limiting the patient's ability to open his mouth to its full extent. Laboratory: Donovan bodies were recovered from the lip, cheek and penile lesions.

CASE 3

History.—A negro man, aged 35, gave a history of granuloma inguinale of 13 years' duration. It began with a penile lesion, and about six years later his oral lesions were described as follows: "The right angle of the mouth is swollen and edematous. Scattered over the mucous membrane of the mouth are very small, reddened granulation areas (3 cm. in size) with white centers." An irregular granulating area was noted on the right side of the palate. No scraping was done at that time.

Four years later the patient noticed that whenever his inguinal lesions became

Fig. 4.—The cicatricial type of lesion. Thick masses of scar tissue located just inside the corners of the mouth have limited the jaw opening to 1 cm.

worse his mouth became swollen and painful. Both conditions improved with treatment. At that time the patient was unable to open his mouth completely.

His next remission occurred about a year later when his oral condition was reported as painful and ulcerated with dirty, foul lesions of the mucous membrane of the mouth and upper and lower lips. There was a contracture of both sides of the mouth which restricted the opening to 1 cm. Scrapings of both mouth and penile lesions were positive for Donovan bodies.

Examination.—In attempting to examine the patient it was impossible to insert the index finger between the cheek and the upper teeth, so thick had the fibrous process become (Fig. 4).

All maxillary teeth were loose and the gum tissue was highly inflamed and exuding pus. Roentgenograms of the temporomandibular joints appeared normal but movements of the mandible in opening the mouth were limited to 1 cm. There was complete lack of lateral excursions of the mandible.

SUMMARY

In these three cases, oral lesions are secondary to active genital lesions, and are the result of autoinoculation. An early and persistent feature of

the oral lesions is fibrous scarification. In Case 3, where the disease has been present for 13 years, cicatricial lesions have become sufficiently extensive to fix the jaws in one position. Patients responded to treatment consisting of tartar emetic, fuadin and anthiomaline. The patients are all negroes, who have a high incidence of this disease. (In a series of 294 cases 9.8 per cent were white.)[9] When the lip is afflicted, it does not become scarified but remains pliable and mobile, and there was no involvement of the lymph glands.

CONCLUSIONS

Oral lesions of granuloma inguinale must be differentiated from carcinoma of the lip, lupus erythematosus, erythema multiforme, gonorrhea of the lip, herpes simplex, stomatitis medicamentosus and syphilis. Oral lesions, like those in the inguinal region, can be classified into three clinical types: ulcerative, exuberant and cicatricial.[10] The services of an oral surgeon may be required in those cases where the jaws are completely bound down by cicatricial tissue. Recovery of Donovan bodies from oral lesions is necessary for conclusive diagnosis.—*Charity Hospital.*

9. D'Aunoy. op. cit.
10. Greenblatt. op. cit.

ERRATUM

We regret the error in the date that appears on page 59 in the article "Osteogenic Sarcoma of the Maxilla" by L. R. Boies et al. in the January 1946 issue of the JOURNAL OF ORAL SURGERY. The correct date is June 10, 1944. We offer our sincere apologies to the authors.

SUBMAXILLARY DUCT AND GLAND STONES: REPORT OF A CASE

RALPH G. PETERSON, D.D.S., Minneapolis, Minn.

History.—A white man, aged 47, presented with swelling and pain below the border of the mandible and in the floor of the mouth on the right side. There were no teeth posterior to the bicuspid teeth on this side of the mandible. Ten years previously he had had some disturbance in his neck. His recollection was not clear, but it seemed that at intervals a slight swelling would arise and subside in his neck without symptoms of pain or tenderness. This, he said, had been diagnosed as inflammation of the glands of the neck. No treatment had been prescribed and in due time the condition had disappeared giving him no trouble until one month before he was seen, when he developed an acute sore throat associated with a generalized gingivitis. He was treated by his physician and dentist for acute Vincent's disease. This attack subsequently subsided except for a mucosal inflammation of the gingiva adjacent to the swollen, elevated and inflamed floor of the mouth.

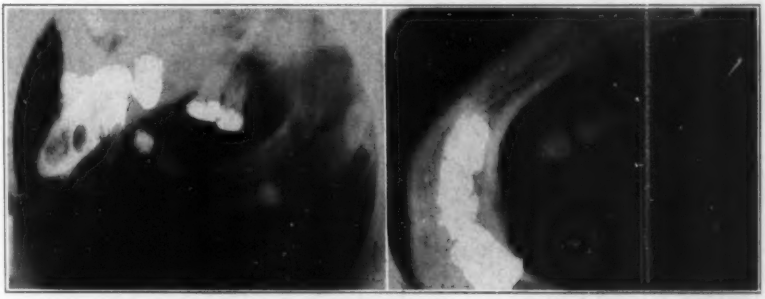

Fig. 1.—Left: Lateral jaw roentgenogram showing four submaxillary duct and gland stones superimposed on the mandible. These might readily have been mistaken for calcific masses within the mandible if an occlusal view had not been made. Right: Occlusal roentgenogram showing the submaxillary duct stones. A small portion of the larger submaxillary gland calculus is barely visible in the upper right corner of the photograph.

Clinical Examination.—The patient's temperature was 99.2°; his pulse, 76. Palpation of the floor of the mouth revealed fluctuation below the surface, and with slight pressure a foul smelling mucopurulent exudate was expressed from the submaxillary duct and through a small rupture in the floor of the mouth. This continued to drain.

X-ray Examination.—Lateral jaw and occlusal roentgenograms (Fig. 1) of the right side of the mandible showed four calcified masses, three large and one small, superimposed on the mandible. These were diagnosed as submaxillary duct and gland stones. Dental roentgenograms also were taken and showed no retained roots or residual infection in the mandible.

Preoperative Treatment.—Treatment consisted of frequent warm water rinses for the mouth and the application of heat to the outside of the neck. A bland diet was prescribed to avoid salivary gland stimulation. In a few days the swelling and tenderness subsided considerably, after which the submaxillary duct stones could be palpated. Drainage was slight on pressure and the patient's temperature was normal.

Operation.—One week after the patient's admission, under procaine infiltration anesthesia, the four stones were removed (Fig. 2) through two separate incisions in the floor of the mouth. One incision was made opposite the lower right first and second molar region and above the stones, and the second was made opposite the third and retromolar area over the submaxillary gland. The posterior stones were found to lie in the upper part of the submaxillary gland just where the duct leaves the gland. The other two lay a few centimeters forward and within the duct. The incisions were left unsutured.

Fig. 2.—Photograph of the removed stones.

Postoperative Treatment.—There was the usual amount of postoperative swelling for two days, with some discoloration in the floor of the mouth. One week after the operation, the incisions were closed, the swelling and tenderness having subsided. Some submaxillary fluid could be expressed and the patient complained of its bitter taste. Pressure on the gland and duct expressed heavy, cloudy, viscid mucoid substance from a sinus in the anterior incision and from the duct orifice. The patient was seen routinely and was kept on a bland diet. The submaxillary gland was still slightly enlarged and easily palpable. One month later the floor of the mouth was well healed, all swelling and tenderness had subsided completely and the patient felt well. The submaxillary fluid was clear but the gland was still palpable.

Recovery was uneventful and the healing was complete three and one-half months following the operation. The patient has resumed his usual diet and is fully recovered.—*950 Medical Arts Building.*

A MYXOMATOUS TUMOR SIMULATING A DENTIGEROUS CYST

JERRY A. MILLHON, D.D.S.,* Rochester, Minn., and
EDITH M. PARKHILL, M.D.,† Rochester, Minn.

This is an unusual case in which a myxomatous tumor, contiguous to an unerupted lower left third molar, simulated a dentigerous cyst roentgenographically. We believe that it illustrates the importance of awaiting the results of microscopic examination before arriving at a final diagnosis.

REPORT OF CASE

History.—The patient, a white man thirty-eight years of age, complained of tenderness in the region of the lower left third molar. One year previously, he had observed acute tenderness on the lingual surface of the left side of the lower jaw. At no time had he noted any drainage. If there was an increase in the size of the jaw in this region it was not appreciable. When the symptoms had first occurred dental roentgenograms had revealed a dark radiolucent area that appeared to arise from the crown of an unerupted third molar.

Examination.—Clinically, this patient's mouth and teeth appeared to be in a healthy condition. Roentgenographic examination revealed that the lower left third molar was unerupted. A dentigerous cyst appeared to be associated with this unerupted tooth (Fig. 1).

Operation.—The patient was hospitalized. Under local anesthesia, an incision about 2 cm. long was made over the crest of the alveolar ridge, distal to the second molar. A second incision was made, starting from the first incision, just distal to the second molar, and extending inferiorly into the buccal fold. The mucoperiosteum was elevated and retracted. With a mallet and chisel, the portion of the alveolar bone which partly covered the crown of the unerupted third molar was removed. The tooth was elevated from its socket and removed. An encapsulated tumor, not like a cyst, was lying distal to the third molar. This tumor was at least 3 cm. in diameter and, at the expense of the bone, had extended well into the ascending ramus. The area of tenderness on the lingual surface of the mandible, first noted by the patient, was apparently the result of the tumor which had caused erosion of the cortical bone. It apparently was not attached to the crown but was lying partly over the crown of the third molar and alongside the distal coronal portion of the tooth. The tumor was enucleated very easily. The mandibular nerve and associated vessels were demonstrated in the base of the cavity and all the way up to the mandibular foramen. The cavity was packed lightly with about 24 inches (60.9 cm.) of iodoform gauze lubricated with petrolatum.

*Section on Dental Surgery, Mayo Clinic.
†Division of Surgical Pathology, Mayo Clinic.

Pathologic Examination.—Gross: The tumor was grayish white in color; it was viscous and had a lobular appearance. Microscopic: The tumor was composed of a delicate myxomatous appearing connective tissue which contained a few fine cords of epithelial cells. The connective tissue was composed of loosely woven spindle-shaped and stellate cells with long delicate fibrillar processes and small compact ovoid hyperchromatic nuclei. Extending throughout the connective tissue were fairly numerous capillary blood vessels. The epithelial

Fig. 1.—Roentgenographic appearance of the unerupted lower left third molar and area distal to the tooth occupied by the tumor. The extreme radiolucent area distal to the third molar is the region where the lingual cortical bone had been destroyed.

cells occurred in narrow cords and resembled the paradental epithelial remnants described by Malassez.[1] The cells were small and uniform in size. They contained small, nearly spherical basophilic nuclei and a scanty amount of pale cytoplasm (Fig. 2).

Course.—About one week after the operation the iodoform gauze dressing was removed and replaced with a new dressing of the same type. No paresthesia was present at this time. A week later, the dressing was again changed. Figure 3 (left) shows the appearance of the mandible at this time. The patient then returned home. His family dentist continued the postoperative treatment. Healing occurred normally and the convalescence was uneventful. The patient returned for examination eleven months after the operation. Figure 3 (right) shows the roentgenographic appearance at this time.

Comment.—In a case of unusual tumor in the jaw, one is always interested in determining the structures that give rise to such an entity.

1. Malassez, L.: Sur l'existence d'amas épithéliaux autour de la racine des dents chez l'homme adulte et a l'état normal (débris épithéliaux paradentaires). Arch de physiol. norm. et path., 3 s., 5:129, 1885.

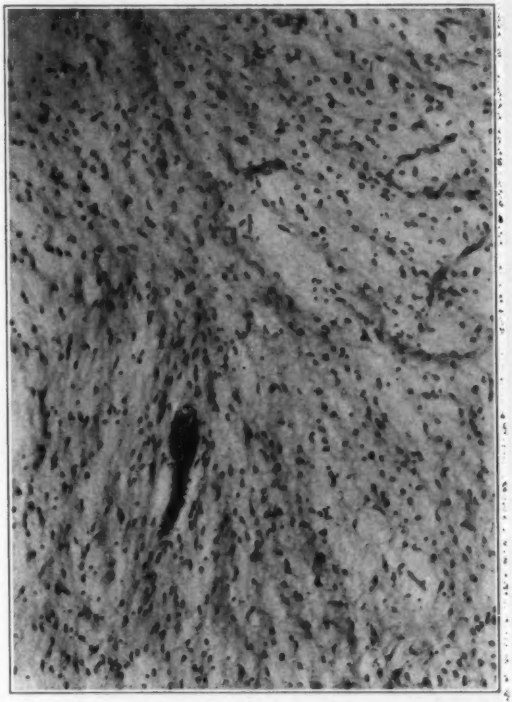

Fig. 2.—Microscopic appearance of tumor, showing myxomatous type of connective tissue and small cord of epithelial cells (× 80).

Because tooth structure is rather complex in its origin, partly ectodermal and partly mesodermal, a variety of tumors may occur. In this case the tumor was composed of both epithelial and connective tissue. It is our opinion that the dental follicle with its enclosed epithelial remnants was the most likely source of origin of this tumor.

Although the dental follicle is composed of connective tissue, there are instances in which epithelial cells can be demonstrated in the follicle. Jacobs listed three sources for these inclusions: (1) remnants from the disintegrating epithelial sheath; (2) embryonic ectodermal inclusions in the mesenchyma from which the follicle develops; and (3) inclusions of cellular elements from the enamel organ.[2]

This case illustrates the value of the roentgenogram as an aid in discovering pathologic conditions. One must never lose sight of the fact that the roentgeno-

2. Jacobs, M. H.: Etiology of Dentigerous Cysts, Multilocular Cysts, Odontomas, and Adamantinomas. Am. J. Orthodont. 25:1190, December 1939.

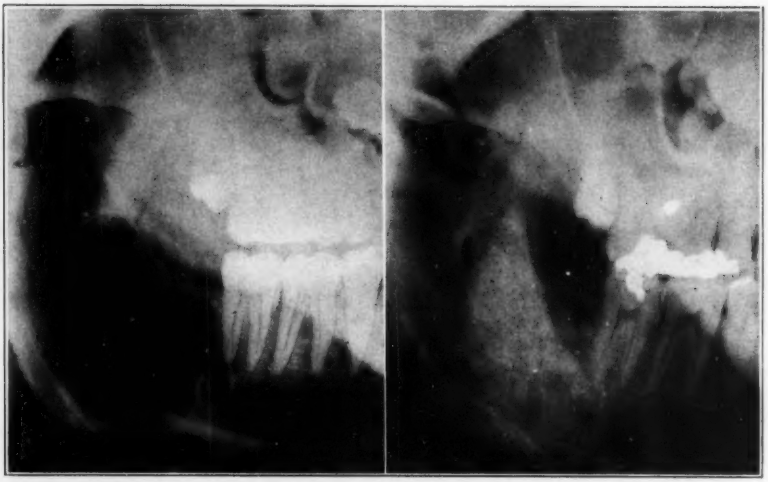

Fig. 3.—Left: Roentgenographic appearance of the left side of the lower jaw two weeks after operation. Right: Roentgenographic appearance of the left side of the lower jaw eleven months after operation. New bone is growing into the region occupied by the tooth and tumor.

graphic findings are not absolute. It is the microscopic examination that determines the final diagnosis.—*Mayo Clinic.*

Examination and Diagnosis.—Today, the field of dentistry must embrace not only the care of the teeth, but also the recognition, diagnosis and treatment of many of the lesions occurring in the oral cavity. Entirely too often, the dental examination confines itself only to the teeth, and frequently more important conditions pertaining to the welfare of the patient are overlooked. I wish I might impress on the dentist the necessity for him to think in terms of the patient's welfare rather than in terms of teeth. Dentistry should meet its responsibility in fullest measure as regards malignant and other growths about the mouth which the dentist frequently sees before the physician does, as the early recognition of these conditions is important for the future welfare and happiness of the patient.—Chalmers J. Lyons, in *J.A.D.A.* 20:3, January 1933.

AMELOBLASTOMA OF THE MANDIBLE—REPORT OF A CASE

PHILLIP E. WILLIAMS, D.D.S.,* and KERWIN M. MARCKS, M.D.†

A twenty-eight year old soldier was transferred to Borden General Hospital, Chickasha, Oklahoma, with a diagnosis of malignant tumor of the left mandible. The type was unidentified and the cause undetermined.

The patient gave a history of having had a carious lower left first molar tooth which had bothered him from time to time. Several civilian dentists had refused to remove it, due to an inflammatory condition which had evidently been present when the tooth was seen by them.

About one month after his induction into military service, the patient had the offending tooth removed. The site of extraction healed without event but approximately one month later a small mass developed on the left side of the mandible and began a slow and steady growth. At the time of the patient's admission the growth was quite noticeable and was described as extending along the inferior border of the left side of the mandible from the anterior margin of the ramus to an area just medial to the mental foramen.

There had been no pain or soreness, but only the discomfort that is so frequently associated with a swollen jaw.

The radiographic examination showed a marked enlargement of the body of the left side of the mandible extending from the cuspid region well past the lower left third molar. The entire portion was filled with numerous large cyst-like areas of bony destruction (Fig. 1). The cortex was expanded downward and lingually and was penetrated along the inferior border of the body of the mandible.

The history, clinical picture and radiographic findings led to a tentative diagnosis of ameloblastoma of the mandible. From a differential diagnostic viewpoint, osteitis fibrosa cystica and central giant-cell tumor were considered. However, the usual associated clinical and radiographic findings were not present.

The extent of the growth precluded the possibility of conservative treatment. Since recurrence is so common if the mass is not entirely removed it was decided to perform a complete resection of the left side of the mandible from an area just below the sigmoid notch to a site lateral to the midline of the symphysis on the right side.

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†Major (MC) Chief of Plastic Surgery Section, Borden General Hospital, Chickasha, Okla.

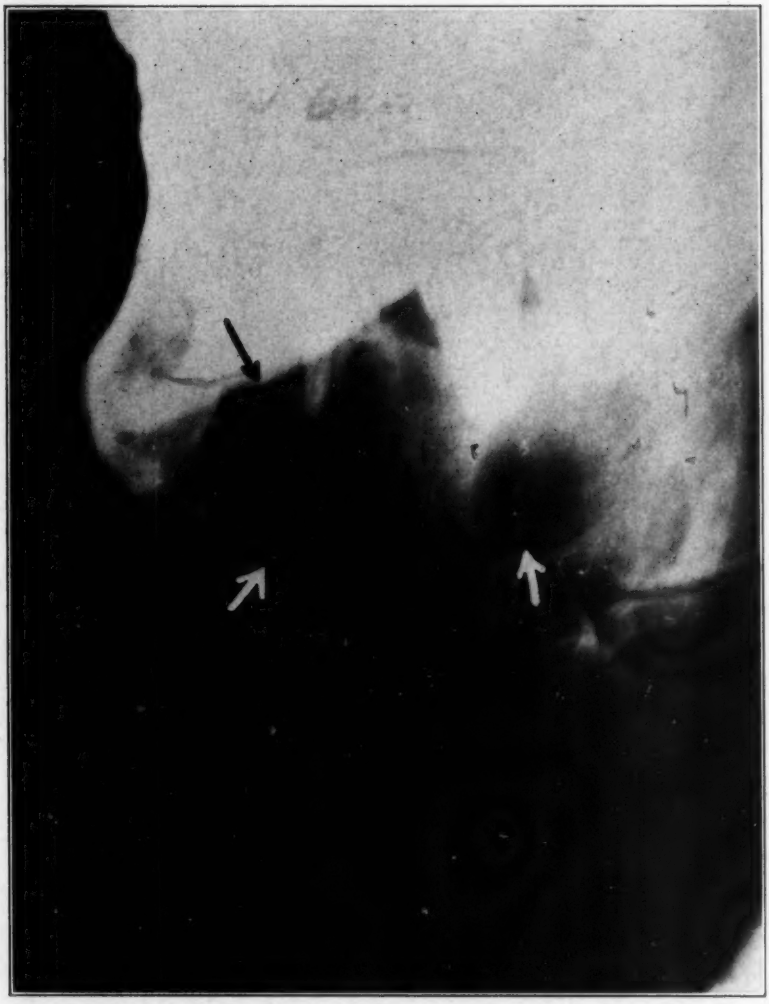

Fig. 1.—Roentgenogram showing extent of mandibular enlargement.

Such tumors are usually of a malignant nature only locally. Hence the urgency of immediate removal of the tumor mass is not present. The development of a good dental ridge should be borne in mind. If the teeth are allowed to remain in the jaw and are removed en masse with the tumor, a marked depression instead of a ridge exists after healing of the soft tissue.

Fig. 2.—Dental ridge developed by employing the technic described in this paper.

A ridge of course facilitates the construction and retention of the prosthetic appliance which is to be inserted (Fig. 2).

Operation One.—Under conductive anesthesia all of the remaining teeth on the left side of the mandible and the right central incisor were removed. Inasmuch as the bone was so frail, every precaution was taken to prevent a fracture of the mandible during the removal of these teeth. The muco-periosteum was reflected and the investing alveolar structure around the roots was removed nearly to the apex of each tooth. They were then removed with little effort and certainly with little force. The soft tissues were approximated and sutured. Considerable postoperative hemorrhage occurred but was controlled with packs and hemostatic agents.

Normal healing occurred and the patient's condition was such that at the end of ten days he was given a thirty-day furlough. Upon his return to the hospital his mouth had completely healed although the lower border of the jaw was more expanded and the soft tissues seemed somewhat fluctuant (Fig. 3).

At this time a cast silver splint (Fig. 4) with attached lugs was constructed for both the maxillary and mandibular teeth of the right side and cemented in place. This was to maintain the occlusion of the teeth and proper relationship of the right side of the mouth during the healing of the left side, following its resection.

Fig. 3.—Appearance of the mandible about one month following the extraction of all teeth on the left side.

Operation Two.—Eight weeks after the removal of the teeth the left side of the mandible was removed. Under nitrous oxide and ether anesthesia, through a naso-endotracheal tube, an incision was made below the mandible, extending from the lobe of the ear posteriorly, to the midline of the neck anteriorly and just above the point of the chin superiorly. The

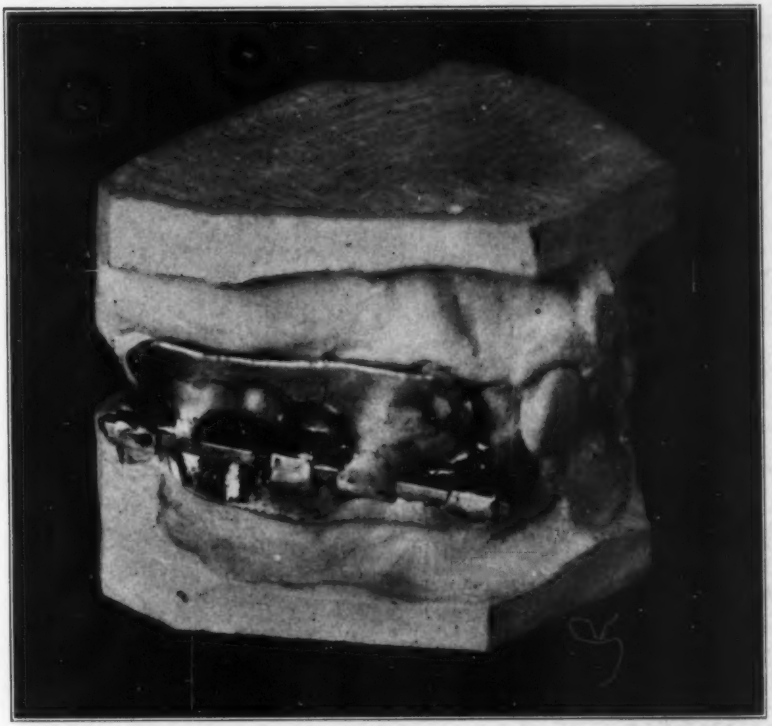

Fig. 4.—Silver splints which maintained the teeth of the opposite side in occlusion during the healing of the wounds following resection, and for a period of three months after the bone graft was in position.

skin, subcutaneous tissue and muscles were undermined, forming a flap which was retracted across the cheek. The facial vessels were ligated and the mandible exposed. All the attached muscles were separated from the bone. The mandible was then severed with bone cutting forceps. The muscles attached to the ramus were separated therefrom and together with the parotid gland were elevated upward exposing the ramus which was then severed about one centimeter below the sigmoid notch.

The muscular attachments on the inner surface were separated and the bone was removed, including a large mass of soft tissue. This tumor mass extended into the neck and had to be separated from the muscles by blunt dissection. Examination of the two cut ends of the mandible showed apparently normal bone.

There was only one small perforation of the oral mucous membrane which

Fig. 5.—Roentgenographic appearance following resection of the left side of the mandible.

was closed with 00 chromic sutures. The wound was dusted with sulfanilamide powder and a rubber drain inserted. The flap was brought down and the various structures approximated and sutured. The skin was closed with C silk and a pressure bandage was applied. About 500 cc. of plasma were given during the operation and the patient's condition was satisfactory upon return to the ward.

His immediate postoperative recovery was splendid. Considerable edema occurred but this was partially due to the disturbance in lymphatic drainage produced by the severance of many lymphatic channels during removal of the jaw (Fig. 5).

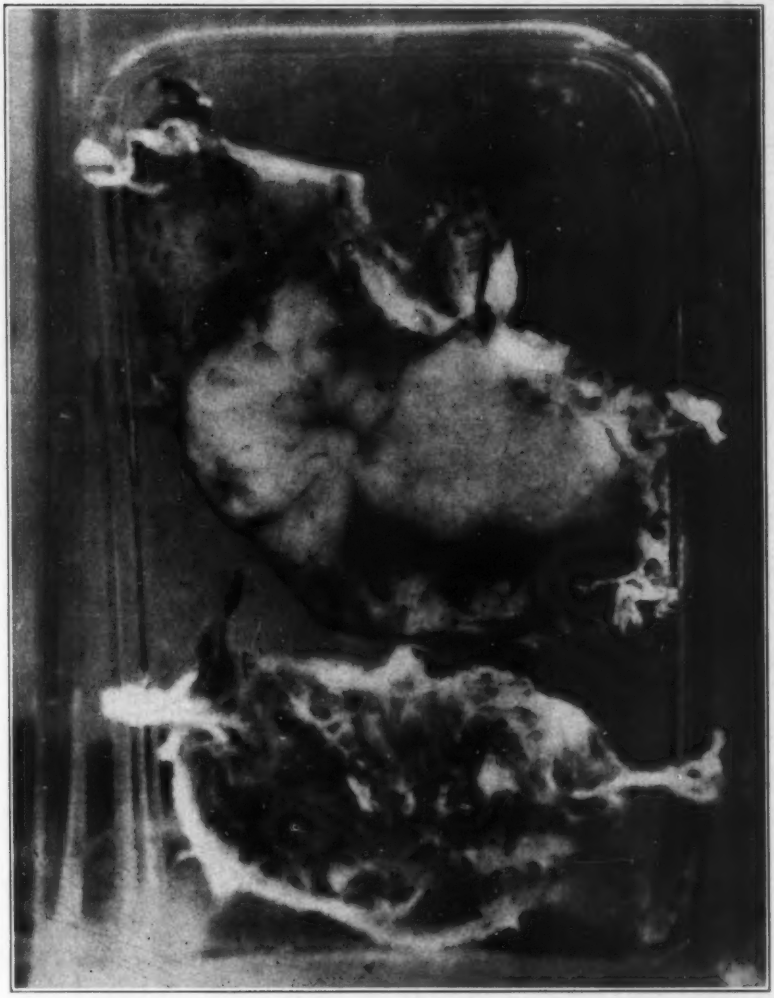

Fig. 6.—Specimen after removal. The extent of the growth and destruction present is obvious.

No difficulty in swallowing occurred, so that the patient was able to take a liquid diet at once. Intermaxillary elastic bands were placed on the lugs of the silver splints at the end of the second postoperative day. Their constant force soon drew the teeth into occlusion. A locking pin was inserted

into the tubes on the appliance, maintaining the jaws in proper position. The patient's convalescence was satisfactory. During the seven weeks required for complete healing the splint was left in place to prevent further contraction from disturbing the approximation of the right mandible to the maxilla in occlusion.

The pathologist was requested to make special sections of the two cut ends of the bone. He reported that the excision had been made well into the normal bone and that no pathologic condition was present at either end. He further reported: The gross specimen (Fig. 6) consists of the body and the ramus of the left mandible, to which was attached a growth 6x4 x 5.3 cm. which invaded the bone. The larger part of the tumor was on the buccal side of the bone, the lower border of the mandible being completely eroded and replaced by neoplastic tissue. The tumor appeared bluish and was covered by a thick fibrous capsule in which there were occasional hemorrhages. The growth cut with relative ease and on section appeared compact, dull, white and interspersed with numerous fine trabeculae.

Microscopic examination showed the tumor to be composed of large columns and strands of epithelial cells embedded in a fibrous matrix. The epithelial strands were for the most part thin and multi-branched, winding through many microscopic fields. Some appeared like tooth buds, others were in the shape of pre-enamel organ structures. In the individual strand the outermost layer of cells was columnar, while the center consisted either of squamous cells or of smaller cells with clear cytoplasm, giving the tissue a reticulated appearance. The supporting stroma was mainly simple fibrous connective tissue but in many areas the fibrous tissue cells were irregularly disposed, their cytoplasm edematous and the nuclei large with prominent nucleoli. Among them were numerous multi-nucleated cells. The stroma presented the appearance of tissue seen in the dental papilla or tooth formation. The miscroscopic examination confirmed the clinical diagnosis of ameloblastoma.

It was decided to give the patient at least six months' rest before any bone grafting was attempted. This allowed time for observation of possible recurrence and insured a more normal condition of the tissues for the reception of the graft.

Operation Three.—At the end of this time nitrous oxide and ether anesthesia was administered through a naso-endotracheal tube. An incision was made in the scar of the previous operation. A flap was undermined and elevated and both the distal and proximal ends of the bone were exposed, freshened and prepared for the insertion of the graft which was obtained from the crest of the right ilium. This portion of bone was fashioned into the form of the missing part of the mandible and wired to the remaining parts with .018 stainless steel wire. The deeper structures were closed over

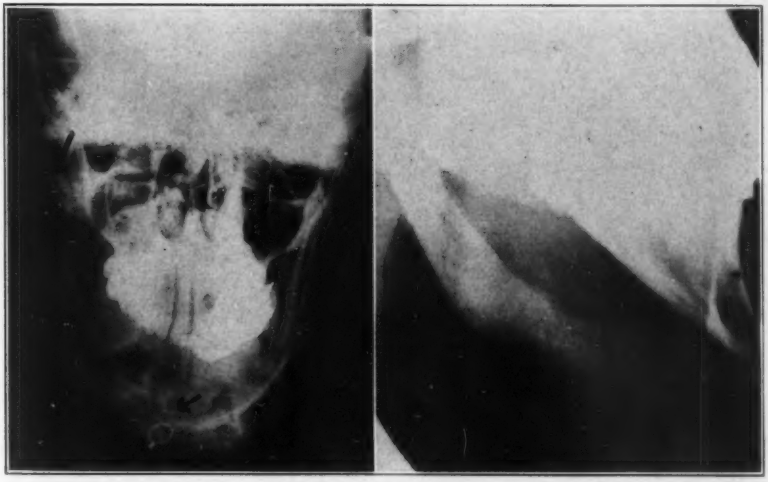

Fig. 7.—Radiographic views of bone graft in position in the jaw.

Fig. 8.—Bone graft in position in the jaw.

Fig. 9.—Partial denture in place as it appears on the cast.

the new bone and the skin was approximated and sutured. Pressure bandages were applied to both the donor site at the hip and to the jaw.

The silver splints were fastened at the completion of the operation and were left in place for a period of twelve weeks so that there could be no movement of the jaws.

Convalescence was again uneventful with normal healing of the soft tissues. There was some drainage of a non-infectious type for a period of several weeks. Finally a small sequestrum was removed and drainage ceased. The wire which had been placed at the symphysis was quite superficial and was removed. The graft had definitely taken to the anterior portion with the remaining mandible. Periodic x-ray examinations (Figs. 7 and 8) showed a marked demineralization followed by recalcification.

At the suggestion of the orthopedic department it was decided to hasten the insertion of the dental prosthetic appliance (Fig. 9) believing that increased pressure and activity would stimulate the recalcification of the graft. This was done with satisfactory results.

SUMMARY

1. Clinical and radiographic findings, together with the history of the case, make possible an accurate diagnosis of ameloblastoma of the mandible.

2. For the purpose of securing a dental ridge for the better reception of the subsequent prosthetic appliance, the teeth are removed and complete healing awaited prior to the removal of the tumor and involved section of the mandible. Healing is facilitated by employing interrupted on-end mattress sutures in closing the mucous membrane.

3. A cast silver splint is used to retain the opposite side of the mandible

Fig. 10.—Cast of the mouth before treatment.

in proper position with the opposing maxilla and normal occlusion is established during the healing of the soft tissues after operation for removal of the diseased bone. The same splint is used after the bone graft has been placed, so that complete stabilization and immobility are effected during the several weeks required for healing.

4. The immediate placement of the graft at the time of the removal of the diseased bone would have simplified the operation considerably and obviated a subsequent operation. It is imperative, however, that no openings be made through the mucous membrane into the mouth, which would allow the graft to be bathed with saliva and thus increase the possibility of the loss of the graft through infection. The use of penicillin in the future will make such contamination considerably less of a hazard. The placing of the graft is much easier because entry is not made through scar tissue. Moreover, landmarks are lost following the removal of such a quantity of original structure and finding and preparing the stumps left after amputation is more difficult if healing has occurred.

CONCLUSIONS

We believe that this case was handled in a practical manner. The removal of an entire section of the jaw was justified, since the growth had invaded the soft tissues, making complete curettement impossible.

The patient has returned to duty or to civilian life, completely cured. Masticatory efficiency has been reestablished and the appearance of his face has not been altered.—*Borden General Hospital.*

Peripheral Nerve Surgery.—It is agreed by neurological surgeons and neurologists that the principles which underlie the surgical treatment of peripheral nerve injuries are not well understood by the civilian and military surgeons who are in positions to give these patients the most advantageous early and primary care. The ideal surgical method of repairing a peripheral nerve injury is an accurate end-to-end apposition of the divided ends at the earliest moment following division with the finest possible suture material which passes through the epineurium of the nerve trunk. Peripheral nerves undergo degeneration through their entire course distal to the site of injury. Degeneration extends to the nerve endings on the muscle fibers. The denervated muscles atrophy, fibrosis occurs in unused joints, tendons lengthen or shorten; in brief, the entire effector mechanism which makes an extremity useful is affected. Muscle atrophy and contractures cannot be prevented by physical therapy methods alone; regeneration of the nerve endings in the muscle must occur before muscle fibers have been completely destroyed. It is of little use to obtain an excellent anatomical union of a fractured bone if the paralyzed and atrophied muscle prevent the movement of the extremity.—Loyal Davis, *Surg., Gynec. & Obst.*, April 1945.

DENTINOMA: REPORT OF A CASE

EDWARD C. STAFNE,* D.D.S., Rochester, Minn.

The dentinoma is one of the rarest of the hard odontomas. It occurs in association with unerupted teeth and develops proximal to the coronal portion of the embedded tooth. It is composed chiefly of dentin. However, it is not a pure tumor and other dental tissues are present as well, including, as in the present case, a sparse amount of enamel. Straith[1] (1936) and Thoma[2] (1941) reported cases of so-called dentinoma. I reported two cases[3] in 1943 and am now describing a third case.

REPORT OF CASE

History.—A woman, twenty-four years of age, complained of discomfort in the region of the lower right third molar. This pain which had been present for several months was assumed to be caused by the eruption of the third molar.

Examination.—Clinical examination revealed redness and slight swelling in the region of the third molar and a small perforation of the mucous membrane through which, on probing, a dense structure could be felt.

Roentgenographic examination revealed a radiopaque mass, slightly more than 1 cm. in diameter, lying directly over the occlusal surface of the crown of a normal and fully developed unerupted third molar (Fig. 1*a*). In view of the inflammation present and the fact that in all probability it would not subside, removal was advised.

Operation.—The odontoma and the unerupted third molar were removed under general anesthesia. The intratracheal method with the tube inserted through the nostril was used. An incision was made and the mucoperiosteum was retracted so as to expose the superior border and the buccal surface of the mandible in the third molar region. A rough bonelike mass which protruded several millimeters above the surface of the jaw could then be seen. The bone buccal and posterior to the odontoma and tooth was removed with a chisel. It separated as readily from the bonelike mass as from the normal tooth. The mass which was attached to the tooth by a layer of soft tissue was then removed to provide better access for removal of the unerupted tooth. To provide additional space and to facilitate delivery of the tooth, the distal cusps were split off by means of a chisel. An elevator was then used to deliver the

*Section on Dental Surgery, Mayo Clinic.

1. Straith, F. E.: Odontoma: a Rare Type: Report of a Case. D. Digest. 42:196, June 1936.

2. Thoma, K. H.: Oral Pathology: A Histological, Roentgenological and Clinical Study of the Diseases of the Teeth, Jaws, and Mouth. St. Louis. C. V. Mosby Company, 1941, p. 951.

3. Stafne, E. C.: Dentinoma: Report of Two Cases. Am. J. Orthodont. (Oral Surg. Sect.) 29:156, March 1943.

Fig. 1.—*a:* Roentgenogram of dentinoma associated with an unerupted lower right third molar; *b:* roentgenogram of the region from which dentinoma and unerupted lower right third molar had been removed four days previously.

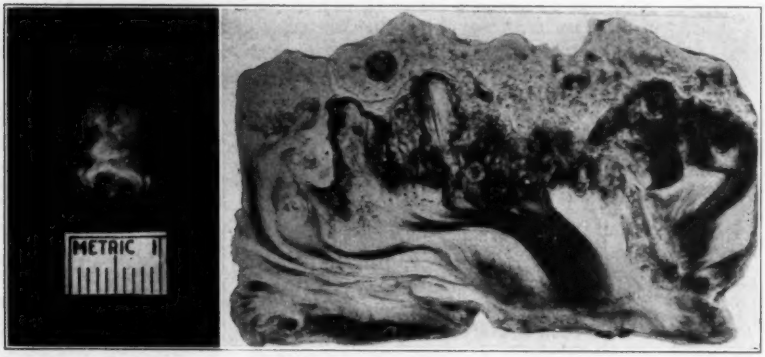

Fig. 2.—Left: Photograph of dentinoma after its removal. Right: Photomicrograph of part of ground section of odontoma showing presence of enamel (× 10).

tooth from its socket. A view of the socket revealed that the mandibular canal was situated lateral to, and at a level well above, the apex of the root of the tooth. However, there was no impingement on the contents of the canal. The socket was then filled with a paste which consisted primarily of sulfathiazole and glycerin and the mucoperiosteum was replaced and sutured to prevent the escape of the medicament. The operation was followed by a moderate degree of swelling, but there was no numbness or paresthesia of the lower lip on the following day. A roentgenogram made four days after operation, is shown in Figure 1*b*.

Pathologic Examination.—A photograph of the odontoma is shown in Figure 2, left. The lower border is that part which approximated the occlusal surface of the unerupted third molar. The specimen was divided longitudinally into two equal parts. One part was decalcified and ground sections were prepared from the other. A photomicrograph of a part of the ground section is shown in Figure 2, right. It included the border of the specimen which was

situated adjacent to the unerupted tooth and a formation of enamel with irregular projections into the dentin can be seen.

Comment.—An odontoma of this type is probably not capable of further growth. However, in the event that it extends to the surface and a communication with the outside is established, removal of it and the tooth with which it is associated is indicated.

The unerupted tooth is likely to be deeply embedded and in close proximity to the mandibular canal. Therefore, it is well to forewarn the patient of the possibility of temporary numbness or anesthesia of the lower lip after operation. —*Mayo Clinic.*

Cancellous Chip Bone Grafts.—It became necessary to replace part of the frontal bone of a child aged 11. (R. Mowlem, *Lancet,* December 9, 1944.) A section of cancellous tissue from the ilium was cut into fragments and inserted through a small incision in the frontal region to fill the cranial defect. The bone chips were applied so that they overlapped both the exposed bony margins of the defect and each other. No endeavor was made to produce a continuous surface, but care was taken to create a smooth contour. The chips were arranged in at least two layers, those in the outer layer covering the gaps between the chips in the lower layer. The wound was closed without drainage, and in ten days the whole mass was clinically sound and firmly united with the cranium. Over a period of months, no absorption was seen; in fact, the condition now is indistinguishable from that seen at the time of discharge over three years ago. This experience completely altered the outlook in the technic of bone grafting and, from that time on, Mowlem has applied the principle of fragmentation of cancellous bone to other areas. The ilium is exposed, and its crest and outer plate are freed from their muscular and aponeurotic attachments. A block of bone of sufficient bulk is then removed with an osteotome, and its cortical covering is discarded. The remaining cancellous mass is divided into chips of various sizes, usually about 1 by 0.5 by 0.2 cm. Seventy-five cases of cancellous chip grafting for the restoration of contour and of continuity in fractures of facial and cranial bones, mandible and tibia . . . have been successful.—Abstr. *J.A.M.A.*

USE OF PETROLATUM AS DRESSING IN THIRD MOLAR SOCKETS: REPORT OF A CASE

LOUIE T. AUSTIN,* D.D.S., Rochester, Minn.

The use of sterile petrolatum in dressings after orthopedic surgery is rather common; it attained favor from the work of Orr. The use of sterile petrolatum in wounds following the extraction of teeth has been described at various times. Exner[1] in 1915 described favorable results from the general use of sterile petrolatum in wounds after extraction. Lartschneider[2] in 1929 reported favorably on the use of sterile petrolatum in extraction wounds, as did Fridrichovsky.[3] Fridrichovsky sutured the tissue tightly. More recently I collaborated in an article[4] in which we reported on a series of 237 impacted third molars. Sterile petrolatum had been used as a socket dressing following removal of these teeth. This report also included data on a series of 222 impacted third molars in which 60 per cent sulfathiazole in sterile petrolatum was used as the dressing in the socket following removal of the teeth. Although it was recognized that petrolatum was difficult to retain in an open socket wound, we found it could be retained more easily where the mucoperiosteum could be sutured over the socket.

Roentgenographic examinations of these patients somewhat later have revealed radiolucence, in a few cases, in the areas from which impacted third molars have been removed. In areas where this situation has been observed, the cavity appears to be smaller than the original socket and there is a very definite limiting outline of the cavity. A case in which one of these sockets has been explored is reported here.

REPORT OF CASE

History.—On April 14, 1939, a woman, twenty-three years of age, came to the Mayo Clinic for the removal of her impacted lower left third molar (Fig. 1a). General physical examination was essentially negative.

Operation.—The impacted lower left third molar was removed on the same day. The coronal portion of the impacted tooth was exposed by means of a

*Section on Dental Surgery, Mayo Clinic.

1. Exner, Alfred: Kriegschirurgie in den Balkankriegen 1912-13. Stuttgart, Ferdinand Enke, 1915, p. 28.

2. Lartschneider: Quoted by Fridrichovsky.

3. Fridrichovsky, J.: Anwendung steriler Fette in der Mundchirurgie. Ztschr. f. Stomatol. 30:862, 1932.

4. Millhon, J. A., Austin, L. T., Stafne, E. C. and Gardner, B. S.: An Evaluation of the Sulfa Drug and other Dressings in "Dry Socket" in Lower Third Molars. J.A.D.A. 30:1839, December 1943.

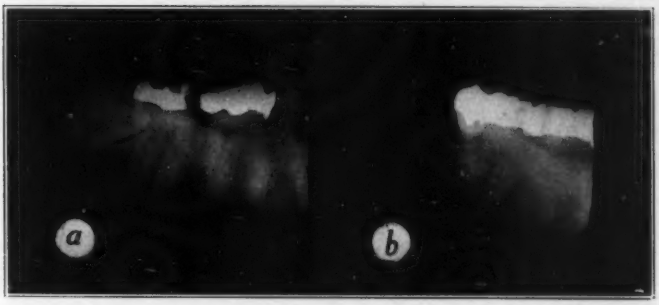

Fig. 1.—Dental roentgenograms made in case in which petrolatum was placed in a lower third molar socket; (a) April 14, 1939; (b) March, 1945.

mucoperiosteal flap and the overlying bony process was removed by mallet and chisel. In order to facilitate removal of the tooth, the distal cusps were split off. This procedure created a space distally through which the tooth was delivered by means of elevators. The socket was filled with sterile petrolatum and the soft tissue was replaced and sutured with catgut. The postoperative course was uneventful. The patient was seen several times until eight days following the operation, when she was dismissed from the clinic. Postoperative roentgenograms made at that time were satisfactory.

Course.—In March, 1945, the patient was seen again for a routine dental examination. Dental roentgenograms were made and a residual area of radiolucency was observed in the region of the socket of the lower left third molar (Fig. 1b). On clinical examination it was found that the region was repaired completely and the patient had experienced no difficulty since removal of the tooth.

Second Operation.—On March 23, 1945, exposure of the alveolar process in the region of the lower left third molar was made by means of a mucoperiosteal flap. The bony process overlying the region was almost completely repaired except for a small opening. The overhanging bony process was removed by means of a chisel and mallet and the bony cavity was exposed. The cavity was filled with petrolatum which apparently was of the same consistency and color as it had been when it was inserted six years previously. The petrolatum was removed and a careful search failed to reveal any membranous lining. The bony wall appeared to be hard and polished. A small fragment of soft tissue which was lying in the mouth of the opening was resected and the laboratory reported that it was inflammatory tissue. The cavity was filled with 60 per cent sulfathiazole in a glycerin base. The soft tissues were replaced and sutured with catgut. The postoperative course was uneventful and the patient was dismissed three days later.

Comment.—In general, experience at the clinic with the use of sterile petrolatum in the sockets of third molars has been satisfactory. The majority of those third molar sockets that we have been able to observe at some time post-

operatively appear to have healed satisfactorily. Radiolucence, however, has been noted in a small percentage of these cases. It is probable, in such cases, that close approximation of the mucoperiosteal flap and rapid healing by first intention did not permit complete evacuation of the petrolatum used as a dressing.

In my opinion, the routine use of dressings is indicated after removal of lower third molar teeth. For some time, a paste, consisting of sulfathiazole (60 per cent) in a water soluble base (glycerin), has been employed, instead of petrolatum, in sockets of this type. Results have been very satisfactory.—*Mayo Clinic.*

Sulfanilamide in Nerve Surgery.—The incidence of infection in gunshot wounds involving peripheral nerves surgically treated immediately after injury was reduced from 38.2 per cent to 5.0 per cent and from 42.9 per cent to 10 per cent when debrided six hours after injury when the sulfonamide drugs were applied locally to the wounds. The incidence of infection in gunshot wounds involving peripheral nerves surgically treated twelve to eighteen hours after injury was reduced from 54.5 per cent to 26.6 per cent; after twenty-four hours from 83.3 per cent to 55.5 per cent when the sulfonamide drugs were applied locally to the wounds. The introduction of sulfathiazole jelly into the bullet tract at the time of injury, followed by surgical treatment twenty-four to forty-eight hours later and the local application of sulfonamide drugs to the wounds, was followed by a reduction in the incidence of infection from 83.3 per cent to 22.5 per cent.—Davis *et al.*, in *Surg., Gynec. & Obst.*, September 1944.

UMI

RANULA (CYSTIC TUMOR): REPORT OF CASE

RALPH G. PETERSON, D.D.S., Minneapolis, Minn.

History.—A white woman, aged 26, presented with an elevated mass in the floor of the mouth on the left side. This mass had been present for about two weeks, when the patient was first seen, and had gradually enlarged until it had become about 2 cm. in diameter at its base. The patient had a full upper denture, and a partial lower denture, the latter not used regularly because it had caused considerable discomfort. She had not been particularly concerned about the condition in the floor of her mouth, as she had experienced periodic swellings in the same region for three years. These swellings would arise, rupture, subside and later recur. The patient was advised to have the tumor operated on while it was distended.

Examination.—Examination revealed a cystic tumor in the left floor of the mouth extending from the first molar to the lingual frenum. It was distended almost to the point of rupturing (Fig. 1).

Operation.—The following day the operation was performed using infiltration local procaine anesthesia. An incision about ¼ inch long was made through the top of the tumor to determine its depth and extent. The contents were a viscid yellowish mucoid fluid. The cystic cavity extended below the normal floor level about 1½ cm. and was conical in shape with the apex down. A lacrimal probe was inserted into Wharton's duct to determine its position. A cap of covering mucous membrane and cyst lining was excised,

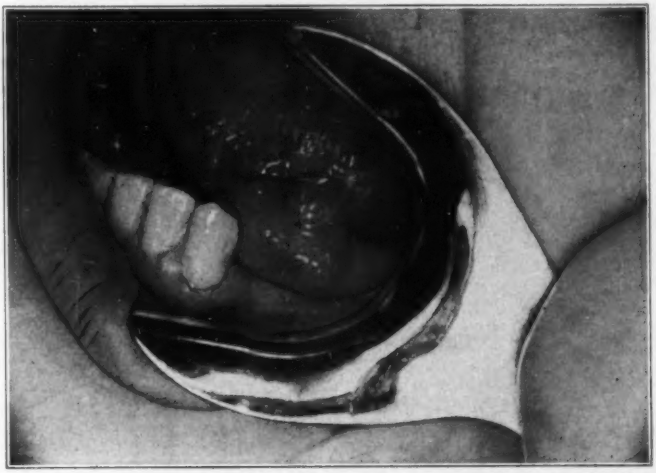

Fig. 1.—Photograph of ranula in the floor of the mouth on the left side.

making an oval opening about ½ inch in diameter. The mucous membrane of the floor was sutured with deknatel silk to the cyst lining around the circumference of the cyst opening, using interrupted sutures. Particular care was taken to avoid Wharton's duct. The cyst cavity was packed with ½ inch ribbon gauze dressing and retained with tension sutures to hold the dressing in place. Sutures were removed on the fifth postoperative day.

Biopsy.—Microscopic tissue study showed epithelial lined cyst wall and attached mucous membrane. The diagnosis was cystic tumor (ranula).

Postoperative.—The patient was seen for routine observation about two and one half weeks after the operation. The base of the cystic tumor was up at the level of the mouth floor with its epithelial lining becoming continuous with the mucosa. The patient had suffered no discomfort but complained of a slight drawing or contracturelike feeling in the affected area. The healing scar contracture ring was visible and palpable.

About eight months later the patient was again examined. She had had no further difficulty since the operation nine months previously.—*950 Medical Arts Building.*

Concentration is an art of slow acquisition, but little by little the mind is accustomed to habits of slow eating and careful digestion, by which alone you escape the "mental dyspepsy" so graphically described by Lowell in the "Fable for Critics." Do not worry your brains about that bugbear Efficiency, which, sought consciously and with effort, is just one of those elusive qualities very apt to be missed. The man's college output is never to be gauged at sight; all the world's coarse thumb and finger may fail to plumb his most effective work, the casting of the mental machinery of self-education, the true preparation for a field larger than the college campus.—Sir William Osler in "A Way of Life."

UMI

MUCO-EPIDERMOID TUMORS OF THE SALIVARY GLANDS: A REPORT OF THREE CASES

JOSEPH L. BERNIER,* D.D.S., M.S., Washington

Recently Stewart, Foote and Becker[1] described a group of lesions occurring in the salivary glands. They designated these lesions as "muco-epidermoid" tumors. Two principal histologic features were present in all of these tumors: epidermoid metaplasia of the ductal epithelium and considerable mucous activity. After a review of the Memorial Hospital collection of approximately 700 mixed tumors of both the major and minor salivary glands, it was their feeling that a little more than 5 per cent could be considered muco-epidermoid tumors. Slightly less than one-half of these were classed as malignant when judged by the usual criteria. Many of the features of mixed tumors in general could be attributed to this group, the similarity being particularly evident in their distribution and age and sex occurrence. An etiologic relationship with ductal epithelium was evident in most of the cases studied, being particularly noticeable in several tumors. In no instance was the usual histologic pattern, so characteristic of mixed tumors in general, apparent. Muci-carmine stains were positive in all of the cases studied.

Metaplastic activity of the ductal epithelium in the salivary glands is a constant source of mucous cells.[2] These are produced either by direct transformation of the basal cell, or through the formation of an intermediate columnar cell. In chronic interstitial sialitis, this process of abnormal differentiation becomes much more apparent due, possibly, to obstruction of the secretory apparatus resulting in hyperactivity of the epithelium. It is further possible that a continuation of this process might result in neoplasia as seen in this group of muco-epidermoid tumors. Certainly the line of demarcation between those cases exhibiting extreme activity of the ductal epithelium, and those in which a diagnosis of frank tumor can be made, is not clear cut. Just when the process of abnormal differentiation becomes true neoplasia is a matter of some conjecture.

At the present time, an analysis is being made of the mixed tumors of the salivary glands in the collection of the Army Institute of Pathology. Its purpose is to attempt a segregation of the so-called muco-epidermoid lesions in an effort to throw further light upon their histologic character and oc-

* Pathologist to the Registry of Dental and Oral Pathology of the American Dental Association, Army Institute of Pathology, Washington, D. C.

1. Stewart, F. W., Foote, F. W., and Becker, W. F.: Muco-Epidermoid Tumors of Salivary Glands. Ann. Surg. 122:820, 1945.

2. Allen, A. C.: So-Called Mixed Tumors of the Mammary Glands of Dog and Man. Arch. Path. 29:589, 1940.

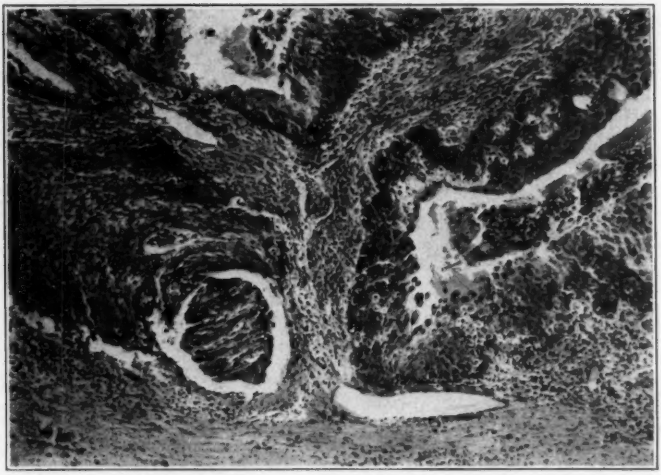

Fig. 1.—Metaplastic activity of the ductal epithelium is prominent. Note the larger pale cells along the inner border of the lining epithelium. These are mucous cells the formation of which is accentuated by the hyperactivity of the ductal epithelium.

currence. Our series of approximately 700 lesions of both the major and minor salivary glands has yielded, thus far, a representative number of these tumors. Close analysis will be necessary to make sure that only those associated with the ductal epithelium are included. It is the purpose of this report to consider three cases from our collection to show the variation between simple ductal hyperplasia, benign neoplasia, and true malignancy in the muco-epidermoid group.

CASE I

Clinical Comment.—A 37 year old white man, while scuffling, about 15 years ago, sustained a blow in the region of the right parotid gland. Shortly thereafter, he noticed a facial paralysis on this side which has persisted to date. In June 1945, he noticed a hard swelling in the region of the right parotid gland which has not increased in size. There have been no other symptoms.

Biopsy.—There was considerable productive fibrosis in evidence. Portions of the parotid gland appeared essentially normal; however, in some areas there was an extreme hyperplastic reaction of the ductal epithelium (Fig. 1). The general configuration of ducts was still in evidence and their lumen were filled with purulent exudate. The ductal epithelium was squamous in character. No keratin pearls were in evidence although intercellular bridges could be seen in some areas. There was considerable hemorrhage and a sprinkling of chronic inflammatory elements throughout the mass. Occasional collections of minor ducts could be noted. These exhibited some dilatation, their lining epithelium

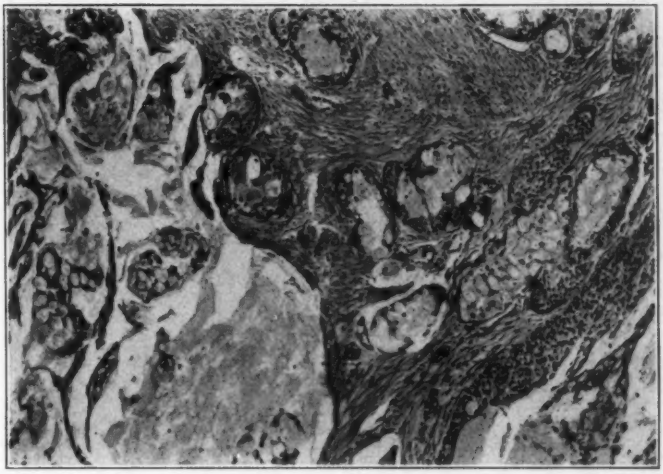

Fig. 2.—Note the smaller collections of epithelium containing plump mucous cells. Large pools of mucin are noted in the left side of the section. The epidermoid (squamous) character of the epithelium may be clearly seen.

being thicker than normal but with no appreciable mucous activity. In the larger ducts, the formation of globlet-like cells could be seen in the outer layers of the lining epithelium. There was no frank invasion of the interstitial stroma by epithelium. Occasional islets of epithelium were noticed but these appeared to be connected with the active epithelium of the major ducts.

Diagnosis.—Squamous metaplasia of the parotid ducts.

CASE 2

Clinical Comment.—A 24 year old white man had noted difficulty, over a period of several years, in shaving the left side of his face but up to two weeks prior to operation he had not been conscious of any tumor in that location. At the time of operation, a round, firm, encapsulated mass, approximately 2 cm. in length and 1.5 cm. in diameter, was removed from the subcutaneous tissue just exterior to the left masseter muscle at a point 2 cm. below the pinna of the left ear.

Biopsy.—The tumor submitted exhibited complete encapsulation over one surface, and several lobules of adherent normal parotid gland. There were isolated secondary lymphoid follicles between the gland and the tumor proper. Interspersed irregularly in an active fibrous matrix were irregular sheets of epithelial cells, many of which are vacuolated. There was some polymorphism, the general character of the epithelium being squamous. There were numerous micro-cysts in which a mucoid-like material could be seen (Fig. 2). Interspersed in this material were collections of granular leukocytes. Mucous cell aggregates could be found throughout the tumor proper in association with the

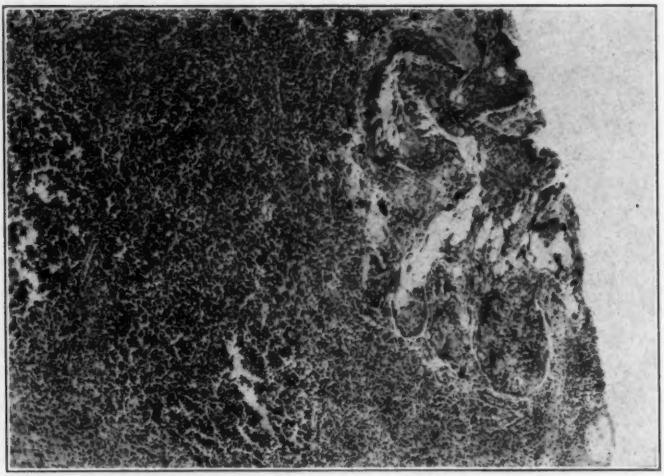

Fig. 3.—Metastic tumor may be seen along the edge of the lymph node. The character of the epithelium is essentially as seen in Figure 4. Note the mucous activity.

epithelium. Occasional mitotic figures were present. In some areas the formation of mucous cells, through the transformation of a cuboidal or columnar epithelial cell, could be determined.

Diagnosis.—Benign muco-epidermoid tumor.

CASE 3

Clinical Comment.—A 22 year old white man was treated for a swelling of the left side of the neck approximately 10 years ago. He was told at that time that he had a tuberculous infection. In August 1944, he was operated upon for a mass in this region. Biopsy diagnosis at that time was malignant mixed tumor of the parotid gland. A year later, he was again seen with a fullness at the left border of the posterior triangle. Anterior to the left sternocleidomastoid muscle there were two large semifluctuant tumors which appeared to involve the parotid gland. They were stony hard but not tender. The entire parotid gland was removed at this time together with the cervical submaxillary and carotid lymph nodes.

Biopsy.—In the material submitted, one side of the specimen was covered by a normal stratified squamous epithelium, some skin appendages being in evidence. Throughout the surrounding mass there were irregular strands and islands of epithelial cells which were epidermoid in character and in close association with collections of mucous cells. In other areas the mucous elements predominated. Numerous mitotic figures could be demonstrated, the general picture suggesting invasion by the epithelium. The overall squamous features of the epithelium were prominent. In certain areas pools of mucoid

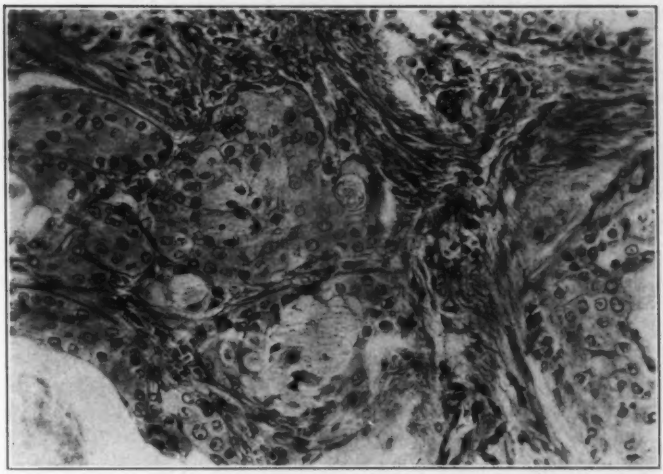

Fig. 4.—Malignant muco-epidermoid tumor. Metastasis from this lesion is shown in Figure 3. The polymorphism of the cells is a feature. Mucous activity, although not prominent, is still noticeable.

material appeared to have escaped into the surrounding stroma, although no foreign body reaction could be seen. There were scattered inflammatory elements throughout the interstitial fibrous tissue. In one of the lymph nodes submitted, tumor tissue similar in character to the primary lesion described was present along one edge (Fig. 3). Cords of squamous epithelium, together with collections of mucous cells, appeared to infiltrate into the sinusoids of the lymph nodes. Mitotic figures were in evidence. The remaining portion of the lymph node had retained its general architecture although it was somewhat reactive.

Diagnosis.—Malignant muco-epidermoid tumor with metastasis to cervical lymph node.

COMMENT

In the three cases reported, the first suggests a process of ductal metaplasia, possibly resulting from an old injury which, because of a reparative fibrosis, has produced a functional stenosis of the gland ducts. This may well be an important feature in the subsequent formation of the muco-epidermoid tumors.[3]

In the second case, there is an attending inflammatory process with the graphic picture of epithelial activity and mucous cell formation as described by the original authors. This overabundance of mucous elements is, according to their findings, consistent with the benignity of the lesions. In these

3. Bernier, J. L.: Mixed Tumors of the Lip. Ann. Den. 4: (No. 2, New Series), 1946.

cases, metastasis is seldom demonstrated although complete removal is imperative. The cellular activity of the epithelium is of considerable importance. In normal ductal hyperplasia the production of mucous cells seems to be confined to the outer layers of the lining cells, suggesting an ordinary process of differentiation. In the transition from the inner zone, the cells adjacent to the mucous elements have a paler cytoplasm and are considerably larger than normal basal cells. The intensity with which they accept the stain will vary with the mucous content. Overproduction of mucus in the benign lesions may occasionally lead to a rupture of the retaining basal layer, the mucoid material escaping into the surrounding stroma. In certain instances a typical foreign body reaction may result.

The third case is an example of the malignant type of muco-epidermoid tumor. The microscopic picture described is not as much in contrast with the benign tumor as one would expect, mucous production being evident to an appreciable degree. This is not in keeping with the finding of Stewart, Foote and Becker, although a single case cannot be indicative of any definite trend. Only when the malignant and benign tumors are studied as groups do their structural differences become readily apparent. The transformation of the benign to the malignant tumor may be a slow and gradual process in which many steps can be identified. An extensive overgrowth of the squamous epithelial elements may tend to preclude the suggestion of an epidermoid tumor. It is possible, therefore, that many extensive malignant lesions represent tumors of this group which have become so overgrown that the mucous element can no longer be seen. It is the tumors in this group which are most often diagnosed as squamous cell carcinoma or adenocarcinoma. In the malignant tumor the character of the epithelium is of major importance. In some instances it will resemble the transitional cell carcinoma and in other instances it will be characterized by a diffuse proliferation of rather small hyperchromatic cells exhibiting some tendency to palisade around the border of the cell collections. Pseudo-acinar structures are often noted.

CONCLUSIONS

Three tumors of the parotid gland are reviewed, the first representing a ductal metaplasia, the second, a benign epidermoid tumor, and the third, a malignant epidermoid tumor. These lesions have been discussed with a view to demonstrating the transition in the activity of the ductal epithelium which has been suggested as the background for their occurrence. A more complete survey of these lesions is being conducted at present in an attempt to demonstrate more clearly the pattern of their histogenesis.—*Army Institute of Pathology.*

MULTIPLE LYMPHOSARCOMA (LYMPHOBLASTOMA) OF THE ORAL AND CERVICAL REGIONS

A. E. JOHNSON, M.D.; K. W. STENSTROM, Ph.D., and C. W. WALDRON, M.D., D.D.S., Minneapolis, Minn.

Lymphosarcoma, a true lymphoblastoma, which may develop wherever lymphoid tissue is present, is the most malignant of lymphatic tumors. It occurs in two forms: generalized, with widespread metastasis, and localized, involving a single group of glands or lymphoid aggregate. Fanale and McCauley[1] recently reviewed the subject, stressing the opportunity of the dentist to observe this and other conditions within his purview in the incipient stages, and thus to bring the condition promptly to the attention of the proper authorities. They also emphasize that lymphosarcoma seems to be related to tooth infection, tonsillar disease and infections of the nasopharynx and maxillary sinuses. Along with the enlargement of lymph nodes, systemic symptoms may include fever, malaise, loss of weight, pallor and weakness, although these may be terminal.

Prognosis is uncertain and generally unfavorable, early detection and therapy offering the best prospect of cure.

Differentiation from other types of lymphoma, tuberculous adenitis, Hodgkin's disease, leukemia and metastatic carcinoma is difficult, but can usually be made by the correlation of clinical, gross and microscopic pathologic findings, together with the history of rapid onset and response to radiation therapy.

HISTOPATHOLOGY

The tumor cells resembling lymphocytes obliterate the normal architecture of the gland, invade its capsule and extend to invade surrounding structures, including muscles and periosteum, to produce induration and fixation of the mass. When situated beneath the oral mucous membrane, rapid growths may present swelling and ulceration. Bone may become invaded and the jaws may be extensively involved.[2, 3]

The case to be reported is of the localized type, although the growth was situated bilaterally and not confined to one lymphoid aggregate.

1. Fanale, S. J., and McCauley, H. B.: Lymphosarcoma of Dental Interest. J. Oral Surg. 3:186, July 1945.

2. Christiansen, G. W.: Lymphosarcoma of Jaws and Palate. J.A.D.A. 25:728, May 1938.

3. Penhale, K. W.: Primary Lymphosarcoma of Mandible. J. Oral Surg. 1:84, January 1943.

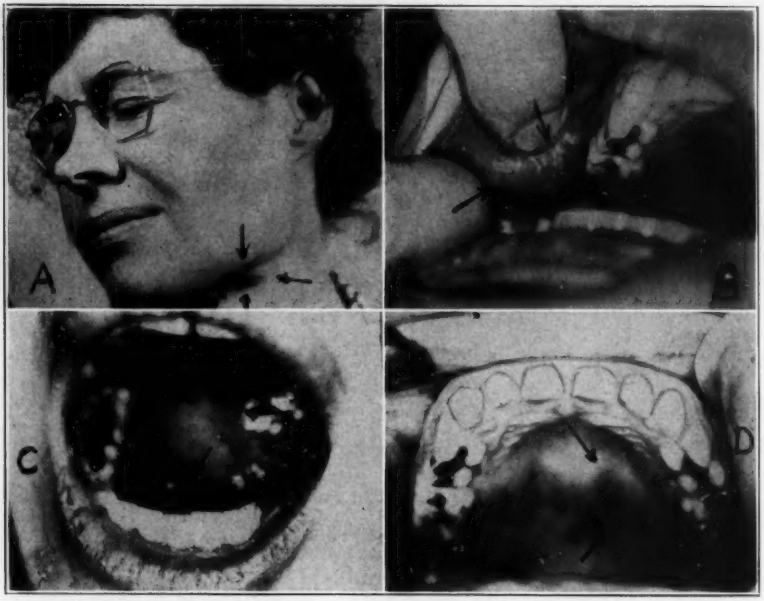

Fig. 1.—Photograph of four independent lesions of lymphosarcoma in the orofacial region in the order of their appearance. A: Submaxillary, left. B: Submucous, right cheek. C: Sublingual, right. D: Palatal, left.

REPORT OF CASE

History.—A woman, aged 40, seen April 3, 1944, complained of four small growths in the mouth and neck. A small lump beneath the left side of the lower jaw had been evident for four months (since November 1943). It had gradually enlarged. A second growth on the mucosal side of the right cheek had been observed for a period of three months. A third enlargement in the anterior part of the floor of the mouth on the right side had been present for two months, and the fourth, a prominence of the left side of the hard palate in the molar region, had appeared but two or three weeks before our examination. There had been virtually no local symptoms accompanying the growths and, aside from worry and consequent impairment in health, there were no systemic symptoms. Just before the onset, the patient had been acutely ill with what was considered to be influenza.

The history was not otherwise significant, though the patient had had typhoid fever, scarlet fever, pneumonia, pertussis, measles, chickenpox and mumps.

Examination.—This was essentially negative. The blood pressure was 130/80. Urinalysis, serology (for syphilis) and blood findings were essentially negative.

There was a visible node in the left submaxillary region that appeared to be

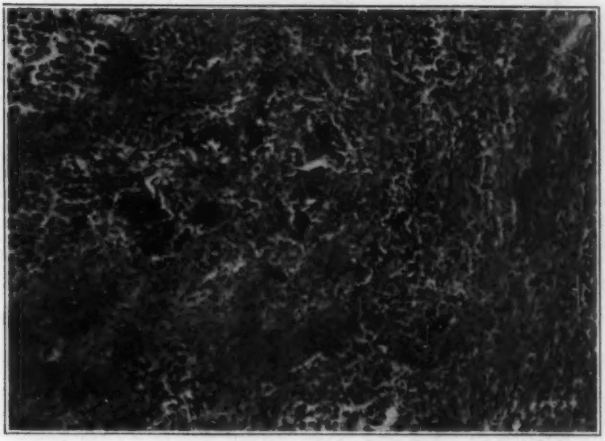

Fig. 2.—Photomicrograph of a section of the neoplasm.

about 2 cm. in diameter. A smaller growth was present beneath the mucous membrane of the right cheek a slight distance anteriorly from and below the orifice of Stensen's duct. Both of these growths were movable and the overlying tissues were normal in appearance. The prominence of the left side of the hard palate was circular in outline, about 12 mm. in diameter and projected about 4 mm. into the oral cavity. The overlying mucosa was somewhat mottled and congested in appearance. The fourth lesion resembled a ranula in every particular and seemed to be about 1 cm. in diameter (Fig. 1).

As the presence of four apparently independent growths within a radius of about 4 inches was unusual, further consultation seemed indicated and the patient was seen by E. T. Bell, professor of pathology, University of Minnesota, whose opinion was that lymphoblastoma was the most likely diagnosis.

Operation.—April 11, 1944, under general anesthesia, excision of the submaxillary node was made rather than simple biopsy, as the capsule was found intact. Palpation through the operative wound failed to demonstrate the presence of other nodes. The wound was closed in layers and the skin sutures were removed on the sixth day after operation. Healing was normal. Microscopic examination of the node confirmed the diagnosis of lymphoblastoma (Fig. 2).

Treatment.—Roentgen therapy was begun April 18 and continued until May 2: 220 KVP; 1 mm. copper and 1 mm. aluminum filter; half value layer, 1.7 mm. copper; 60 cm. target skin distance.

To each of one right and one left lateral field 10 by 11 cm., 1,250 r (air) was given, including cheek and cervical regions in ten treatments over a period of fifteen days. In addition, 300 r was given to small fields over the region of nodes in the right cheek and left submaxillary area, and through oral cones 300 r to the nodules in the roof of the mouth and right cheek and 600 r to the

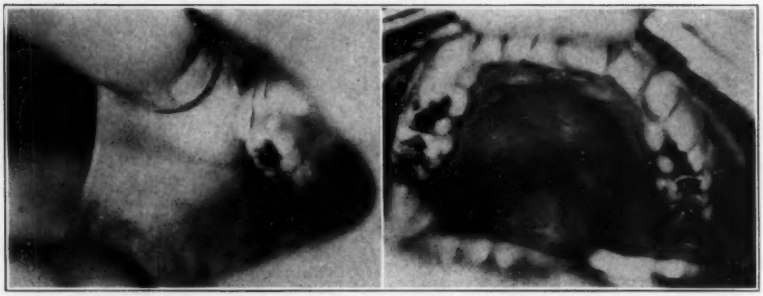

Fig. 3.—Photographs showing complete disappearance of cheek and palatal lesions.

nodule in the anterior part of the floor of the mouth. The total dose to each one of the four nodules was estimated as 2,000 tissue r.

One week after the last x-ray treatment, the lesions in the palate and floor of the mouth had completely disappeared. There remained some thickening and induration in the cheek and submaxillary region and the insertion of radon was decided upon.

May 10, five radon implants (of 6.5 mc. total) were inserted about 6 to 8 mm. apart around the circumference of the indurated area in the right cheek and one radon implant 1.3 mc. was placed externally from the midportion of the area. Three radon implants (3.9 mc. total) were placed around the indurated area in the submaxillary region. The walls of the implants consisted of 0.3 mm. gold. The tissues in the indurated areas received a minimum of 6,000 roentgens.

Outcome.—The response was prompt, and two weeks later all areas were soft, with no evidence of thickening or induration.

The patient has been examined at three and four month intervals since completion of therapy and there has been no evidence of recurrence or of new tumor formation. Systemic examination yields no evidence of nodes in other parts of the body. The patient has been advised to return at least twice a year for examination (Fig. 3).

COMMENT

This case of multiple lymphosarcoma of the oral-cervical region is an example of the wide variety of tumors that may be seen by the oral surgeon. Its apparent cure is in a measure due to relatively early diagnosis and institution of treatment. It might well have been diagnosed a month or two earlier and treated to thus further improve the prognosis in this individual case.—*General Hospital, University of Minnesota.*

TORUS: REPORT OF CASE

LOUIE T. AUSTIN,* D.D.S., Rochester, Minn.

Torus of the mandible is an exostosis which occurs on the lingual surface of the mandible usually in the region of the bicuspids although it may extend as far posteriorly as the third molar. It may be unilateral but in most instances it is bilateral. Single or multiple protuberances may develop. These are of clinical significance only when they become so large that they interfere with the use of the tongue, or in edentulous cases, when they interfere with insertion of dentures. Patients are usually unaware of the exostosis until someone calls their attention to it. In the case which I am reporting, the condition was bilateral and there were multiple nodules.

REPORT OF CASE

History.—The patient was a man, 59 years of age, who was referred by his dentist to the Mayo Clinic on January 10, 1941, for the removal of the mandibular tori prior to the insertion of a denture. His teeth had been removed prior to his arrival at the clinic.

Examination.—The patient's general physical examination gave essentially negative results. Clinical examination revealed marked multiple protuberances on the lingual surfaces of the mandible on both the right and left sides. These extended from the cuspid regions to the first molar regions. The one on the right side is shown in Figure 1.

Fig. 1.—Torus mandibularis on the right side.

*Section on Dental Surgery, Mayo Clinic.

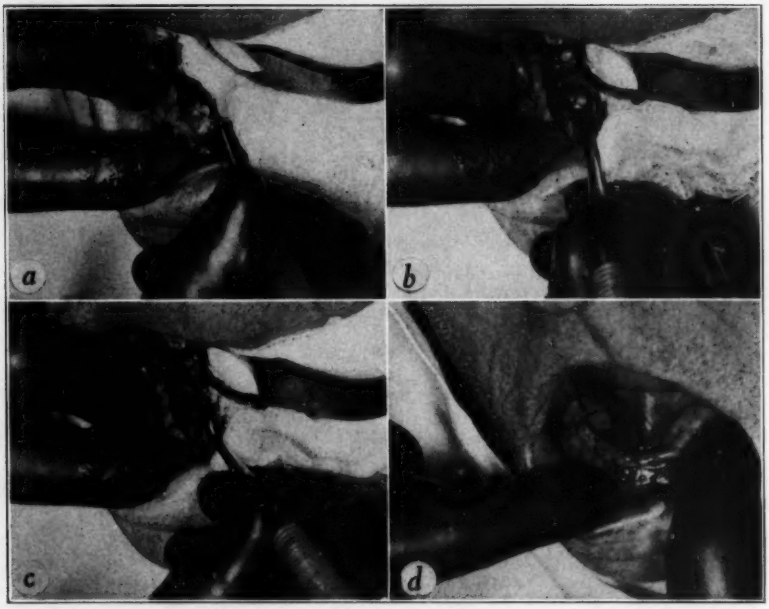

Fig. 2.—Technic used for removal of torus mandibularis: *a*, incision and retraction of mucoperiosteum; *b*, removal of the torus by means of a chisel; *c*, appearance of the alveolar ridge following removal of the torus; and *d*, the mucoperiosteum after it has been replaced and sutured in normal position.

Operation.—Nodules were removed from both sides on January 10, 1941, under local anesthesia.

An incision was made along the crest of the alveolar ridge, extending from a point anterior to the cuspid region to the second molar region. The mucoperiosteum was retracted lingually to uncover and expose the entire protuberance (Fig. 2*a*). A chisel was placed with its cutting edge at the base of the protruding bone and cuts were made to separate each nodule from the surface. The separation of the last nodule is shown in Figure 2*b*. Following removal of the nodules the surface was made smooth by means of the chisel (Fig. 2*c*). The mucoperiosteum was replaced and sutured in its normal position (Fig. 2*d*). The procedure was repeated for the removal of the exostosis on the left side.

Postoperative Course.—There was no elevation of temperature on the day after operation but a moderate amount of swelling was present. The patient was dismissed on the fourth postoperative day at which time swelling had subsided.

COMMENT

Since satisfactory wearing of a lower denture would have been impossible for this patient, removal of the exostosis seemed definitely indicated. Occa-

sionally, when nodular formation is not too extensive, the dentist is able to relieve the denture over the nodules and avoid the necessity for their removal. The soft tissue overlying the bony prominences, however, is usually thin and provides little cushion. The situation, therefore, is difficult to handle if the nodules become prominent. Since excision is comparatively simple, removal is the procedure of choice if insertion of a denture becomes a problem.—*Mayo Clinic.*

Intravenous Anesthesia in Children.—Up to the present time it has been the consensus that pentothal sodium is a poor agent for intravenous use in children; first, because of the difficulty of venipuncture, and, second, because of the poor tolerance of children to barbiturates. There is no essential difference in the kind of drug given in childhood and in later life, and the question, "When does pediatrics end?" is still a moot problem. A discussion of the drugs used for children demonstrates the similarity of drugs used for children and in the adult and proves that if drugs are used carefully they can be administered at any age. The author (Holly, *South. M. J.*, 1944, p. 631) has found from clinical experience that children tolerate pentothal sodium as well as adults. The history of intravenous anesthesia is reviewed from the use of chloral hydrate in 1874 to the present administration of barbiturates. The effects of the drug pentothal sodium on the systems of the body are mentioned. A 2.5 per cent solution is prepared and the administration performed by means of equipment consisting of one three-way valve to which is attached a piece of rubber tubing 8 inches long. On the end of the tube is a Luer glass tip; to this tip is attached an intravenous needle of 1¼ inch length and of 22 to 24 gauge, beveled and sharp-pointed. The veins in the antecubital fossa are usually selected, also the wrist veins or the great saphenous vein, anterior to the internal malleolus. Premedication for children up to five years of age consists of atropine sulfate given thirty minutes before operation; for children over five years of age, nembutal [pento-barbital sodium] given one hour before operation, and atropine sulfate given thirty minutes before operation. . . . Fractional amounts of the agent are given as need for depth presents itself. Indications for the drug . . . include any type of operation except bronchoscopy. The more severe the illness, the greater is the indication for the drug. It can be used in acute shock and hemorrhage. "If you can get into a vein, you can administer pentothal as an anesthetic agent for the same surgical procedures that are performed in adults." It is contraindicated in inflammations that encroach on the trachea, neck and posterior pharyngeal wall, and in operations that involve the skin only. . . . The advantages . . . include its rapid induction, comparatively good relaxation, economical use and safety.—Abstr. *Surg., Gynec. & Obst.*

DELAYED UNION OF MANDIBULAR FRACTURES

CHARLES J. CASHMAN,* D.M.D., Chicago

Delayed union is a relative term. Mandibular fractures vary in many respects, are complicated in many ways, and the period of time required for clinical union will vary with the severity of the associated complications. Mandibular fractures in which no severe complications are present will usually develop clinical union within four to six weeks following injury. Those with severe complications may require a year or more for clinical union to develop.

Many cases of mandibular fracture are seen having no associated complication, or complications of a very minor nature, and yet clinical union is not evident three to six months following injury. Delayed union can usually be avoided in such cases by correct treatment and early eradication of the complication responsible for the delay. Certain fundamentals apply to the treatment of any fracture and are based upon the avoidance of all factors tending to interfere with the physiology of normal bone repair.

NORMAL BONE REPAIR

Immediately following a fracture there is hemorrhage, both from the adjacent soft tissues and from the fractured ends of the bone. There is extravasation of blood and serum into the tissues of the surrounding area, the space between and around the fractured ends becoming filled with blood clot. This is the first stage in the normal repair of a fracture.

A complicated vascular and cellular response occurs at the time of injury. The blood supply to the area is increased and there is an outflow of leukocytes and other cells into the tissues surrounding the fracture. Partly by self digestion, and partly by the activity of leukocytes, dead cells and tissue are absorbed and the wound is cleansed of all débris resulting from the injury that might interfere with repair. This is the usual inflammatory reaction that follows any injury, the degree of the reaction varying with the severity of the trauma or other causative agent.

About the fourth day following injury, granulation tissue, composed of fibroblasts and small capillaries, begins to sprout from the periosteum near the site of fracture and from the fractured bone ends. Granulations gradually permeate the network of fibrin in the blood clot, eventually replace the clot, and fill the space between the fractured ends. The width of the space determines the time necessary for it to become completely filled by this connective tissue and is a factor in the time required for clinical union to occur.

*Lieutenant Colonel (DC) AUS.

Under normal conditions, changes begin to occur in the granulation tissue about the sixth to the tenth day following injury. A cartilaginous matrix begins to form between the fibroblasts owing to the activity of osteoblasts which are present in the granulation tissue. This cartilaginous matrix, or osteoid tissue, eventually fills the gap. At first it is excessive in amount, surrounding the fractured ends as well as filling the gap between. It is spongy in character, somewhat elastic, and is uncalcified.

Osteoid tissue becomes calcified and is then known as callus. Callus is irregular in structure, cancellous, with unusually large trabeculae. It is not true bone. Because it is calcified it has the mechanical properties of bone and thus aids in immobilizing the fracture. When the fractured ends become united by callus, repair has reached the stage of clinical union and the danger of delayed union is past. Clinical union is usually evident in uncomplicated mandibular fractures within four to six weeks following injury. There is no roentgenographic evidence of union at this stage of repair. Callus is eventually replaced by true bone. In mandibular fractures, roentgenographic evidence of bony union is seldom seen until ten to fourteen months following injury.

The process of calcification is not completely understood. There is some controversy regarding the method by which inorganic salts are deposited in the cartilaginous matrix and as to which is the more important factor, the activity of osteoblasts or the process by which calcium salts are deposited in the matrix formed by their activity. According to some investigators, an enzyme, phosphatase, is responsible for the deposition of inorganic salts at the site of repair. It is known to be present in large amounts in areas where calcification is taking place. It is believed to be a product of osteoblasts and the cells lining the inner layer of periosteum. It is thought to cause the tissue fluids in the immediate vicinity of calcification to become supersaturated with tri-calcium phosphate which is then deposited in the cartilaginous matrix.

In general, calcification depends upon the formation of a cartilaginous matrix in granulation tissue by the activity of osteoblasts, the presence of adequate concentrations of calcium and phosphorus in the tissue fluids at the site of repair, and the deposition of these salts in the matrix produced by the activity of osteoblasts.[1]

FACTORS INFLUENCING REPAIR

The factors which interfere with normal bone repair and thus delay union may be divided into those due to systemic causes, and those due to local or mechanical causes.

Among the more important systemic causes are rickets, osteomalacia,

1. Key, J. A., and Conwell, H. E.: Fractures, Sprains and Dislocations. St. Louis: C. V. Mosby Co. 1942.

hyperparathyroidism, nephritis, acute febrile diseases, malaria, avitaminosis and deficient diet. It is not within the scope of this paper to discuss the treatment of these conditions, nor the manner in which they tend to delay union of a fracture. Two of these factors, avitaminosis and deficient diet. warrant a brief discussion since they may be the underlying cause of delayed union in otherwise normal individuals.

Diet.—Proper diet and the presence of certain vitamins exert an important influence on the process of bone repair because of the effect upon calcium-phosphorus metabolism and the deposition of these salts in the process of calcification.[2]

Bone is composed principally of tri-calcium phosphate and calcium carbonate. Calcification and repair of a fracture depend upon the presence of both salts in the tissue fluids at the site of repair, which in turn is related to their concentration in the blood plasma. The amount of these minerals furnished in the diet and absorbed by the intestine influences the amount available. The skeleton of the body also constitutes a calcium store for the maintenance of calcium requirements when the exogenous sources are somewhat deficient. The treatment of mandibular fractures normally requires a liquid diet of which milk forms a large part, and the daily intake of calcium is therefore usually adequate. Phosphorus is also present in milk as well as in egg yolk and meats. Since eggs also constitute a large part of the diet of these patients, an adequate daily intake of both calcium and phosphorus is assured.

Vitamin deficiency is a much more important factor. Vitamins C and D are of the greatest importance for the normal repair of bone. As neither of these vitamins is stored to any great extent, an adequate daily supply is essential. Vitamin C is necessary for the normal development and function of osteoblasts. In its absence, osteoblasts are unable to form the intercellular cartilaginous matrix in which the salts of calcium and phosphorus are deposited and without which calcification cannot proceed. The normal daily requirements of vitamin C are furnished by three ounces of orange juice or 25 to 50 mg. of ascorbic acid. Vitamin D influences the absorption of calcium from the intestine and facilitates its deposition at the site of calcification. Vitamin D also influences the deposition of phosphorus by its effect upon the enzyme, phosphatase. Vitamin D increases the calcium-phosphorus content of the body fluids, making them more available for calcification. Vitamin D is practically absent from the American diet and it is essential that it be administered daily.[3] The average daily requirement is supplied by 4 cc. of cod liver oil, or 400 units U.S.P. of vitamin D.

2. Best, C. H., and Taylor, N. B.: Physiological Basis of Medical Practice. Baltimore: Williams and Wilkins Co. 1943.

3. McLester, J. S.: Nutrition and Diet in Health and Disease. Philadelphia: W. B. Saunders Co. 1939.

Mechanical and Local Factors.—Mechanical and local factors are responsible for delayed union in most instances. In the presence of severe local complications such as severe infection, gross loss of bone and periosteum, interposition of adjacent soft tissues, and restricted blood supply, the period of time required for repair is long and indefinite. Non-union rather than delayed union often results from such serious complications. Lack of apposition, the presence of motion at the site of fracture, and a mild infection persisting in the vicinity of the fracture line are minor complications tending to delay repair. They can usually be avoided.

Apposition.—Close apposition of the fractured ends reduces the time required for repair. The ability of the body to bridge a gap is limited and varies in different individuals. The greater the space between the fractured ends the more difficult it becomes for the reparative tissues to bridge the gap, and a proportionately longer time is required for clinical union to occur. The fibroblast, a much more primitive and unspecialized cell than the osteoblast, can proliferate under more adverse circumstances. If the space is too great, fibrous tissue instead of osteoid tissue will eventually fill the gap between the fractured ends and bony union cannot occur.

Mobility.—Mobility at the site of fracture is one of the most common causes of delayed union and is usually avoidable. Repair is a cellular mechanism. Motion at the site of fracture causes a tearing and injury of the young cells and vessels comprising the granulation tissue which is attempting to bridge the gap in the fractured bone. The injury produced by motion induces an inflammatory reaction. The delicate blood vessels become engorged and damaged. An increased fluid tension occurs which causes a stasis of the circulation and deprives the delicate tissue of the nourishment necessary to maintain vitality. Hemorrhage may occur as the result of injury caused by motion. Hemorrhage makes it necessary for organization to begin over again in the traumatized area with a consequent delay in the healing process. If motion is permitted to continue over a long period, the adverse conditions may be sufficient to interfere with the activity of osteoblasts and repair will be by fibrous tissue. At best, normal repair will be delayed when motion is permitted to occur.

An inflammatory reaction in the region of the fracture not only delays repair but also predisposes to bone absorption. The initial inflammatory reaction and the formation of granulation tissue which follow injury produce a slight absorption of the fractured ends. This is commonly observed roentgenographically by an increase of the fracture interspace which is greater two weeks following injury than it was at the time of injury. Bone absorption ceases as the initial inflammatory reaction subsides. Bone absorption will continue if an inflammatory reaction persists in the fracture area owing to the irritation of motion or other factors, and there will be a further widening of the gap which will delay final repair.

The degree and direction of motion at the site of fracture influences the amount of trauma produced, the degree of the resulting inflammatory process, and the time required for final repair. When the fractured ends move across each other with a shearing action, the granulation tissue is torn across the entire length of the fracture line. This is particularly true when the fracture line is narrow and the ends are in contact. This type of motion is commonly observed in fractures of the mandible at the symphysis. An angular motion stretches tissue and is usually slight. Granulation and osteoid tissue are elastic to some extent so that slight angular motions, which stretch rather than tear tissue, may occur without causing as much injury as will motions of a shearing type. In the early stages of repair, any motion, however slight, will cause some injury to the delicate tissues attempting to repair the fracture and will delay final repair.

The theory that slight motion through the fracture line hastens the healing of a fracture is erroneous. It is true that callus responds to slight injury incident to motion by the production of additional callus. Callus also heals rapidly when injured. However, sufficient callus formation to support the fracture does not usually occur until four to six weeks following injury. It has been shown that motion at the site of fracture tends to delay repair rather than hasten it. Absolute fixation should be continued as long as there is clinical evidence of mobility at the site of fracture. Function should not be permitted until there is evidence of clinical union, unless fixation is being accomplished by a splint or other appliance which permits function. Absolute fixation for a period of three to six weeks is a safe minimum in the average uncomplicated mandibular fracture. As the area of the mandible involved approaches the symphysis, the longer the period of fixation ordinarily required because of the greater influence of muscle action and leverage in causing displacement and motion.

The manner of obtaining fixation and the type of appliance used are not of great importance. The most simple method or appliance that will insure the best results is preferable. It is important, however, that fixation be established as early as possible, that it be absolute, and that it be continued until complete organization of the tissues responsible for repair is demonstrated by clinical union. It is also important, regardless of the method or appliance used, that the patient be seen daily to assure the maintenance of absolute fixation as well as proper oral hygiene.

Infection.—Infection is another common cause of delayed union. It may occur due to a break in the overlying tissues at the time of injury, during manipulation, or following motion. It may also occur owing to the presence in the vicinity of non-vital or infected teeth, teeth with deep pocket involvement which communicate with the fracture line, infected third molar flaps, and teeth in the line of fracture. Severe infection in the region of the fracture greatly retards healing because of destruction of the blood clot and

granulation tissue or by actual destruction of bone. A slight infection of the blood clot incurred at the time of injury may be eliminated by the defense mechanism during the initial inflammatory reaction. Chemotherapy and penicillin have proved of great value in combating infection associated with compound fractures of the mandible.

The presence of a focus of infection in the teeth adjoining a fracture is often overlooked because of the absence of clinical manifestations of gross infection. The presence of such a focus may cause a mild inflammatory reaction to persist in the tissues between the fractured ends, or active infection may occur. The manner in which a persistent inflammatory reaction and active infection retard repair has been discussed above. The condition of the teeth adjoining a fracture of the mandible should be definitely determined early. Questionable teeth should be carefully observed and all definite foci should be eradicated as soon as the particular case permits.

CONCLUSION

Delayed union of mandibular fractures having no severe complications may be avoided in most instances by rational treatment and the elimination of those factors which may interfere with normal bone repair. The most ideal conditions for normal bone repair are assured by close apposition of the fractured ends, early and absolute fixation continued until clinical union has occurred, the elimination of local infection, and a proper diet which includes an adequate amount of vitamins C and D.—*20 North Wacker Drive.*

Aristotle somewhere says that the student who wins out in the fight must be slow in his movements, with voice deep, and slow speech, and he will not be worried over trifles which make people speak in shrill tones and use rapid movements. Shut close in hour-tight compartments, with the mind directed intensely upon the subject in hand, you will acquire the capacity to do more and more, you will get into training; and once the mental habit is established you are safe for life.—Sir William Osler in "A Way of Life."

PERIODONTAL CYST: REPORT OF CASE

EDWARD C. STAFNE,* D.D.S., Rochester, Minn.

The periodontal or dental root cyst is an epithelial-lined sac, usually situated at the apex of the root of a tooth. The cyst is derived from epithelial remnants of the periodontal membrane, and the stimulus which in most instances incites a proliferation of epithelium is probably inflammation. Formation of the cyst is always preceded by degeneration of the pulp of the tooth from which it develops. The following case is that of a periodontal cyst which probably had its origin from a mandibular right central incisor.

REPORT OF CASE

History.—A man, forty-four years of age, was seen on April 19, 1939. He was concerned about a bone cavity in the anterior region of the mandible that had been revealed by roentgenographic examination elsewhere several months previously.

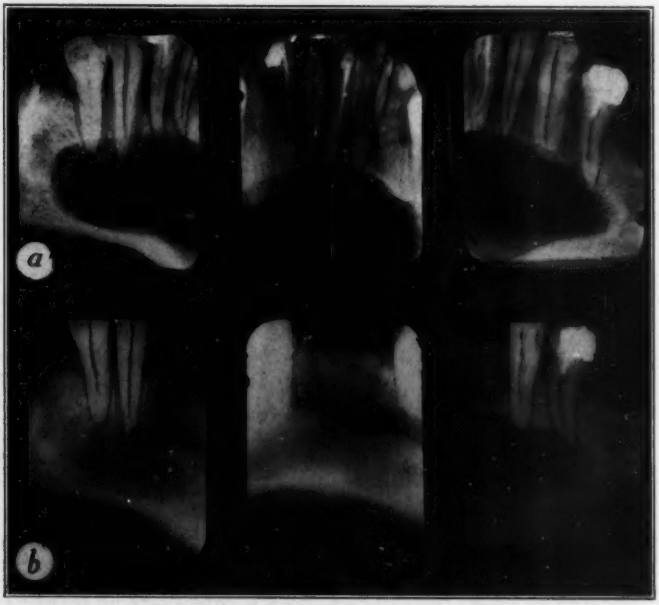

Fig. 1.—Roentgenograms in a case of periodontal cyst: *a*, preoperative; and *b*, postoperative.

*Section on Dental Surgery, Mayo Clinic.

Fig. 2.—Photomicrograph showing portion of wall of epithelial-lined cyst (× 100).

Examination.—On clinical examination a slight bulge was noted on the labial surface of the mandible in the region below the root ends of the teeth. There was no enlargement or bulging on the lingual surface. All of the mandibular incisors failed to respond to tests for vitality.

Roentgenographic examination revealed a bone cavity extending from the lower second bicuspid region on the right to the lower second bicuspid region on the left (Fig. 1*a*). There was evidence of a definite break in the lamina dura of the right central incisor, a tooth which had been pulpless for several years. In view of this finding, a tentative diagnosis of periodontal cyst was made and removal advised. The result of a general physical examination was essentially negative and there were no bleeding tendencies present.

Operation.—The cyst was removed on April 20, 1939, after local anesthesia had been induced by right and left mandibular block injections, supplemented by infiltration of the labial mucoperiosteum. The mandibular incisors, all of which had been loosened from periodontal lesions, were first extracted and a left second bicuspid root was also removed. The cuspids and first bicuspids were retained. A horizontal incision was made which extended from a point directly opposite the first bicuspid on the right to a point directly over the first bicuspid on the left and at a level slightly below the roots of the teeth. The mucoperiosteum was retracted revealing a very thin layer of bone overlying the cyst. A portion of the bone extending laterally to both sides from the median line was removed, producing an opening of sufficient size for removal of the cyst and later for convenient introduction of postoperative dressings. With the aid of a blunt instrument the upper and lower borders of the cyst were freed from the bony walls. The cyst was then grasped in the beaks of a tissue forceps, carefully pulled away from the lateral borders and delivered intact through the opening. The wound was sprayed with sulfathiazole powder and a gauze dressing was inserted.

Course.—On the following day there was no appreciable postoperative swelling, the temperature was normal, and there was no paresthesia or numbness of the regions supplied by the mental branches of the inferior dental nerves. A portion of the dressing was removed on the fourth day after operation; the remainder was removed and replaced on the sixth day. Subsequent dressings were changed at intervals for a period of two months when they were discontinued. A partial denture which was made a few days after removal of the cyst was worn throughout the postoperative course. From a roentgenogram made on September 21, 1939, it appeared that the cavity formerly occupied by the cyst was gradually being filled with bone (Fig. 1*b*). A photomicrograph of a portion of the cyst wall, showing inflammatory changes and the lining of squamous epithelium, is illustrated in Figure 2.

SUMMARY

In the treatment and management of cysts of the jaw, the surgical procedure one intends to perform must be carefully considered. In this instance extraction of all teeth in the region of the cyst and removal of the alveolar ridge overlying it would no doubt have been followed by rapid healing and a relatively short postoperative course. However, this procedure would have resulted in some deformity and an unfavorable foundation for an artificial denture. Therefore, a method was chosen in which the alveolar ridge could be preserved, although a more prolonged postoperative course of treatment could be anticipated.—*Mayo Clinic.*

Neither the nature nor the amount of our work is accountable for the frequency and severity of our breakdowns, but their cause lies rather in those absurd feelings of hurry and having no time, in that breathlessness and tension; that anxiety of feature and that solicitude of results, that lack of inner harmony and ease, in short, by which the work with us is apt to be accompanied, and from which a European who would do the same work would, nine out of ten times, be free.—William James, quoted by Sir William Osler in "A Way of Life."

UMI

TRANSITIONAL CELL CARCINOMA (LYMPHO-EPITHELIOMA) OF THE UPPER JAW: REPORT OF CASE

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The transitional cell carcinoma, a highly malignant tumor, occurs most commonly in the nasopharynx and the pharynx and at the base of the tongue as does also lymphosarcoma, with which it may be confused. Both are frequently extremely radiosensitive and, even in the presence of cervical metastasis, have disappeared completely under roentgen therapy. The pathology of these tumors has been studied extensively. It is Schmincke's[1] belief that they are epithelial neoplasms of branchiogenic origin, but many pathologists do not agree with this concept of etiology. They are composed of a netlike syncytium of epithelial cells with lymphocytes occupying the interstices, growing in true symbiosis. Ewing[2] writes:

> The transitional cell carcinomata arise from stratified epithelium of which the cells are delicate, without spines, do not produce keratin and show little capacity to hornify. . . . The structure of the growth shows sheets of large delicate cells with thin membranes, large nuclei and indefinite cell outline. They infiltrate the submucosa in sheets or small groups or singly.

New, Broders and Childrey[3] say:

> It seems superfluous to call such growths transitional cell tumors. To do so is to create another type of carcinoma when there is no sound basis for doing so. It seems better that their identity with squamous cell tumors should be maintained.

In clinical features, these tumors are different from the ordinary squamous cell carcinoma. The growth usually starts as a soft swelling without ulceration and may be mistaken for an abscess. The correct diagnosis and treatment may therefore be delayed, with disastrous result. Consequently, in such highly malignant tumors of the upper jaw and palate, the retention of the term "transitional cell carcinoma" might well be desirable in order that roentgen therapy may be promptly instituted rather than mutilating surgical excision be undertaken later, with almost certain recurrence. The case to be reported, now without recurrence for nearly twelve years and without deformity, might have ended disastrously had surgical measures been employed.

1. Schmincke, Alexander: Ueber lymphoepitheliale Geschwuelste. Beitr. z. path. Anat. u. z. allg. Path. 68: 161-170, 1921.

2. Ewing, James: Some Phases of Intraoral Tumors with Special Reference to Treatment by Radiation. Radiology 9: 359-365, November 1927.

3. New, G. B.; Broders, A. C., and Childrey, J. H.: Highly Malignant Tumors of Pharynx and Base of Tongue. Surg., Gynec. & Obst. 54: 164-174, February 1932.

Fig. 1.—Transitional cell carcinoma of upper jaw, showing tumor enlargement and region where mucous membrane had been perforated by tumor cells. The posteriorly thickened membrane and dilated vessels are shown.

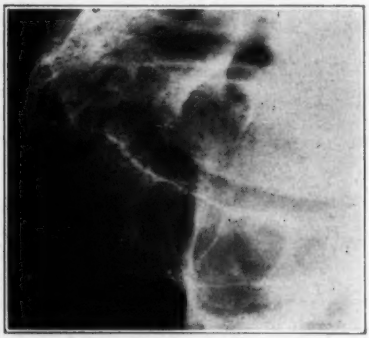

Fig. 2.—Oblique occlusal x-ray appearance of region of tumor. It is not diagnostic of tumor formation or type.

REPORT OF CASE

History.—A woman, aged 48, seen April 19, 1934, complained of an enlargement of the left side of the upper jaw that had, for several months, prevented wearing of an upper denture. There were no symptoms except for an indefinite feeling of pressure and discomfort. A slowly increasing enlargement had been evident for about seven months. Three years earlier, a "pimple like" area of irritation had developed under the denture, but had cleared up and was apparently of no significance. The patient had worn a full upper denture for many years.

The history was of no importance.

Examination.—General physical examination revealed no abnormalities and the findings of routine laboratory examination of blood, urine, etc., were within normal limits.

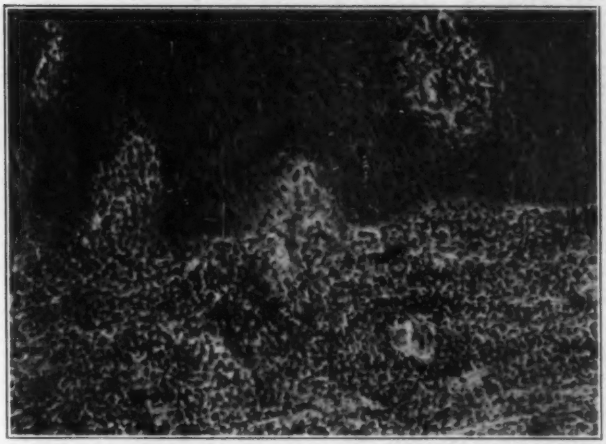

Fig. 3.—Photomicrograph of biopsy of transitional cell carcinoma (lymphoepithelioma) of the upper jaw.

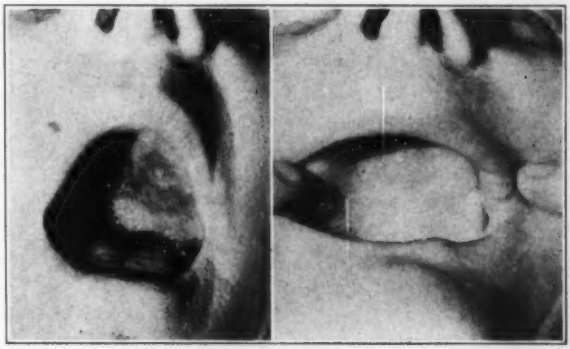

Fig. 4.—Left: Appearance two weeks after completion of x-ray therapy, showing complete disappearance of tumor and mucous membrane healed, but mottled and congested, owing to x-ray reaction. Right: Normal appearance of upper jaw and palate, several months after treatment.

Examination of the mouth revealed a large tumor of the posterior half of the upper jaw on the left side extending from the bicuspid region posteriorly to involve the region of the tuberosity and to extend distally from it. The tumor mass projected down from the palate about 8 mm. and extended from the midline of the palate over to the alveolar process ridge, which was increased in size, with a buccal prominence above the level of the ridge. Two excoriated areas or perforations of the tumor tissue through the mucous membrane were present on the palatal aspect. (Fig. 1.)

Distally from these areas over the posterior portion of the palate was a raised area of mucous membrane with dilated vessels on its surface. The palatal aspect of the tumor was soft on palpation, being suggestive of cystic fluid under tension. There was no evidence of cervical or generalized adenopathy, and complete nose, throat and ear examinations failed to reveal anything significant.

X-ray examination of the alveolar process and palate was not conclusive, there being no signs of invasive destruction of bone, but rather a multicystic appearance, possibly suggesting ameloblastoma (adamantinoma), but not definitely. Multiple transverse bony partitions of the floor of the maxillary sinus might well have a similar x-ray appearance. (Fig. 2.)

A small section of tumor tissue removed for biopsy proved to be lymphoepithelioma (transitional cell carcinoma). (Fig. 3.)

Treatment.—Deep x-ray therapy, started April 23, 1934, was continued until April 30: 200 KVP; 1 mm. copper + 2.5 mm. aluminum filter; half value layer, 1.5 mm. copper; 60 cm. target skin distance, 10 by 15 cm. fields, one to each side, including cheek and cervical regions.

Each time, 500 r (air) was given, a series of four treatments in eight days and a total of 1,000 r to each side. The diameter of the face was 12 cm. and the tumor dose amounted to about 1,200 tissue roentgens.

Course.—The tumor subsided in about two weeks and the contour of the palate, the alveolar process and the tuberosity region became essentially normal. The mucous membrane discoloration, an effect of the therapy, cleared up gradually. (Fig. 4, left.)

Outcome.—The patient was examined two and a half months later, at which time the upper jaw appeared normal in every particular. November 8, 1934, she was again examined, and x-ray examination was made of the alveolar process and palate. There were no signs of recurrence. (Fig. 4, right.)

In September 1935 (sixteen months after roentgen therapy), the upper jaw was found to be normal in contour, in color and in consistency of the mucous membrane. The patient was advised that her dentist could proceed with the construction of new dentures.

Check-up by mail discloses that the patient has had no further trouble and wears dentures with satisfaction. Her husband, seen in May 1945, stated that, with the exception of arthritis, she is perfectly well, now eleven years after treatment.

COMMENT

This highly malignant, yet extremely radiosensitive tumor, though somewhat rare may come under the care of the oral surgeon. Adequate therapy necessitates full and completely unbiased cooperation of the surgeon and the roentgen and radium therapist in order to effect a cure.—*General Hospital, University of Minnesota.*

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